RAILROAD GAZETTE

FRIDAY, JULY 16.

Contributions.

The Bavarian Experiments on Train Resistance.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your issue of June 11, contains an interesting *résumé* by Baron M. M. Von Weber of some extensive experiments on train and curve resistance at Munich. These experiments, in purpose, method of test, and many of the conclusions arrived at, are strikingly similar to some which the writer made about the same time on the Lake Shore & Michigan Southern Railway.* In other and very important respects they differ widely from each other, and a brief comparison may not be without interest to some of your readers. Extracts from Baron von Weber's article are printed in solid type.

"The Royal Bavarian Railroad Administration seized the opportunity, incited by the eminent engineer, Director of Construction von Röckl, in order to obtain a basis for the more rational location of a number of railroad lines, the construction of which was intended.

In the year 1875, the Department of Construction of this administration proceeded to arrange for these experiments, which were carried out in the years 1876, 1877 and 1878."

The writer's experiments were made in 1878 with a precisely similar purpose, although with no such immediate object in view.

"For making the experiments there was available a very favorable piece of ground, nearly horizontal and sufficiently large. On this horizontal trial tracks were constructed of good materials, one straight and others of 1,000, 750, 550, 400, 300, 200, 150 and 100 metres radius. [In American vernacular, 1° 38′, 2° 21′, 3° 9′, 4° 20′, 5° 45′, 8° 40′, 11° 34′ and 17° 20′.] As motive power, a steep incline 1.5 metres (5 ft.) high was used in part, and part of the time locomotive power, by which the rolling stock was started with a speed as high as 43 kilometers (27 miles) per hour upon the trial tracks and there left to itself. The runs were observed by means of a chronograph with a seconds pendulum, a telegraph wire along each track, and two galvanic batteries. The diagrams obtained made it possible to read with certainty the time of running every 20 metres (66 ft.) within one-tenth of a second, which exactness is necessary, and to estimate it within one one-hundredth of a second, so that, since no further impulse was given during the trial run, the co-efficients of resistance could be ascertained from the decreasing speed."

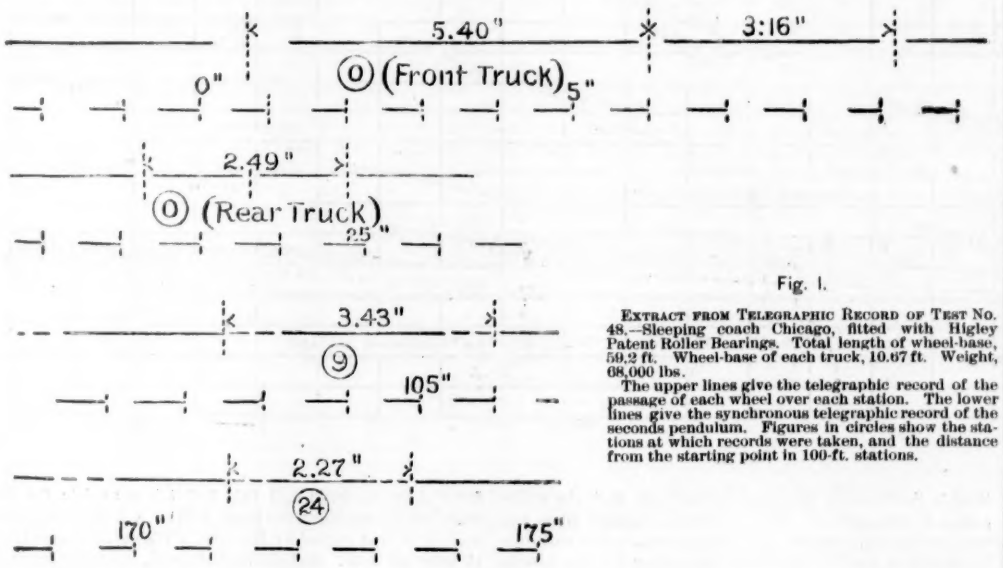


Fig. 1.

EXTRACT FROM TELEGRAPHIC RECORD OF TEST NO. 48.—Sleeping coach Chicago, fitted with Higley Patent Roller Bearings. Total length of wheel-base, 59.2 ft. Wheel-base of each truck, 10.67 ft. Weight, 68,000 lbs.

The upper lines give the telegraphic record of the passage of each wheel over each station. The lower lines give the synchronous telegraphic record of the seconds pendulum. Figures in circles show the stations at which records were taken, and the distance from the starting point in 100-ft. stations.

The writer used, for most of his experiments, a single section of the main track of the Lake Shore & Michigan Southern Railway, 6,400 feet long, with a 1° curve (5,730 ft. radius) 3,000 feet long in the middle. (A few other experiments on different curves were made elsewhere at an earlier and later date). The method of observing the runs, by the aid of electricity and a chronograph with seconds pendulum, was precisely the same as that described above. It enables time observations to be read off with great ease to within one-twentieth to one-fiftieth of a second. The writer's record was taken with an ordinary Morse recording instrument, equipped with a double armature, one connected with the telegraph wire along the track, and the other connected with a seconds pendulum, giving a record of the form shown in Fig. 1.

The only difference in the methods of test was that the writer experimented with a track on a uniform descending grade (36 feet per mile), which gave a constantly *increasing* velocity (his cars being started generally from a state of rest), while the Bavarian experiments were made on a level track, and hence with a constantly *decreasing* velocity. This, however, is a mere detail, having no influence whatever on the correctness or convenience of the method.

In the Bavarian experiments "4,917 different tests were made with 20 different passenger and freight cars, used singly and in combinations, especially three together, and nine locomotives." The writer's tests were made with some 50 different cars (taken at random from the yard when needed) in trains of one, two, three and five cars together, with freight and passenger, with a few tests of a single locomotive. The number of tests, however, was very much less, not over 100 in all, although as nine to eleven resistances at varying velocities were determined in each test, the difference was not so great as may at first sight appear.

In appliances for delicate precision the two sets of experiments appear to have been substantially on a par and in the computation and generalization of results the personal equation is of comparatively little importance, the computations being of a simple though monotonous character and easily checked against any gross errors.

We may now proceed to a

COMPARISON OF DEDUCTIONS FROM THE TESTS.

"Even vehicles of uniform construction and weight, in consequence of various irregularities and according to their degree of wear, exhibit very different resistances, some being even twice as great as others. *Moreover, runs with the same identical vehicles, on the same track and with the same initial speed, never give the same results.* It follows from this that a useful average result can only be obtained by a great number of trials with a great number of vehicles."

Judging by the writer's experiments the above paragraph is expressed far too strongly. Fluctuations occur which are inexplicable, but he was rather surprised to find these so few and small. He rarely observed greater differences than 1 lb. to 1½ lbs. per ton (of 2,000 lbs.) in different vehicles under similar circumstances, and he repeatedly made several successive tests of the same vehicles under the same circumstances in which the differences between each one of nine successive resistances at increasing velocities (determined in each test) were only 2 to 5 per cent. He must, therefore, dissent from the italicized clause at least:

"The resistances increase on the whole with the load, it is true, but not in so great a proportion; that is, *the co-efficient of resistance decreases with the load.*"

This corresponds precisely with the writer's conclusions, which were that "the axle and rolling friction of empty freight cars may be taken as 6 lbs. per ton of 2,000 lbs. at low velocities. The axle and rolling friction of coaches and loaded freight cars may be taken as 4 lbs. per ton. The fluctuations from these limits are small, rarely exceeding 1 lb. per ton in single cars, or ¼ to ½ lb. per ton in a train."

This curious fact, the direct contrary of the generally received opinion, may therefore be considered as well established. The writer believes himself to have been the first to determine it, at least in America; his results, in fact, having been a source of dismay and astonishment, until their possible correctness was supported by the publication of Prof. Thurston's direct experiments on axle friction.

"Locomotives universally have greater co-efficients of resistance than cars.

"The resistances of all vehicles increase with the speed, and in a higher proportion than the direct one. For *straight lines* the application of the method of the least squares to the results of 1,230 experiments gave the following empirical formula:

a. For cars:

$$\rho = 0.0025 + 0.00000021 v^3$$

b. For locomotives:

$$\rho = 0.0050 + 0.00000021 v^3.$$

"In which ρ = the co-efficient of resistance and v the velocity in kilometers per hour."

In American vernacular, giving resistances in lbs. per ton for velocities in miles per hour:

$$R = 5 + .00175\ V^3 \left(\text{or } \frac{V^3}{572} \right)$$

and for locomotives

$$R = 10 + \frac{V^3}{572}.$$

THE CONSTANT RESISTANCE for cars given above (5 lbs.) will be seen to be precisely a mean between that determined by the writer for loaded and empty cars. The writer's experiments on locomotives also indicated from 8 to 10 lbs. per ton, substantially identical with the above.

THE VELOCITY-RESISTANCE in the above formula differs from that determined by the writer (and all previous experimenters) and is discussed hereafter.

"From more than 2,000 results of experiments the following empirical formula was found for the co-efficient of the average additional resistance of empty and loaded cars on curves, with special regard to combinations of cars, and also of the locomotive, which comes nearer to an actual railroad train than single cars:

$$W = \frac{0.6504}{R - 55}$$

in which R indicates the radius in metres."

In American vernacular

$$W \text{ in lbs. per ton} = \frac{4266.7}{R - 180.4} = \frac{4266.7\ D}{5730 - 180.4\ D}$$

In which R = radius in feet and D = degree of curvature = (approximately) $\frac{5730}{R}$

This gives for a

1°	curve,	0.75	lbs.	per	ton	per degree of curvature.
2°	"	0.80	"	"	"	"
4°	"	0.85	"	"	"	"
8°	"	1.00	"	"	"	"
16°	"	1.50	"	"	"	"
20°	"	2.00	"	"	"	"

The writer's determinations were that "the resistance of a 1° curve is over 1 lb. per ton at a velocity of 12 miles per hour, and decreases to about ¼ lb. per ton at a velocity of 22 miles per hour. The resistance of an 8° curve is over 8 lbs. per ton at a velocity of 9 miles per hour, and decreases to about 6½ lbs. per ton (probably) at a speed of 19 miles per hour."

Thus we have again a substantially exact coincidence as to the average resistance.

"The degree to which the resistance depends on the length of the wheel-base could not be ascertained with certainty, as too small a number of cars with the larger wheel-base was available."

The writer's conclusions were that "the average resistance of a 1° curve to 4-wheel trucks, having a 5-foot rigid wheel-base, and to 6-wheel trucks having a 10⅝-foot rigid wheel-base (except for the play of the boxes in the pedestal-jaws), appears to be about as 0.83 to 0.93, the latter not well determined but sufficiently so to indicate that the difference is much less than generally supposed."

To this it may now be added that these experiments at Munich (made exclusively with four-wheel cars having wheel-bases of 12 to 14¼ feet) seem to prove conclusively that the difference is in fact "much less than is ordinarily supposed," since they are substantially identical in results with the writer's tests of American rolling-stock with "bogie" trucks.

"Likewise the influence of tight and loose coupling of the cars on the resistance could not be established, although many tests were made for this purpose."

The writer's conclusions on this point were that "it appears possible that the act of coupling together cars by a loose link slightly decreases the axle friction; and hence, presumably, the oscillating friction at high velocities. The average reduction observed from coupling four or five cars together appeared to be as much as one-half pound per ton."

No explanation of this curious indication was then attempted nor is it asserted as a fact. Such was the apparent answer, however, to the "question put to nature," and it was deemed wiser to record it than to reject it, because seemingly inexplicable.

The above includes all the points common to the two series of experiments, *with the exception of the effect of velocity on train resistance.* It will be seen that they are as closely identical as could reasonably be expected.

IN THE DETERMINATION OF THE VELOCITY RESISTANCES, however, the writer believes that the engineers of the Royal Bavarian Railroad Administration have fallen into very grave error, and he desires, in the interests of truth, to point out, *first*, that the extent and gravity of the error is undeniable,—by comparison with known facts,—and, *secondly*, to point out, so far as he can, the origin of the error.

That the error is very large, and totally different from a mere error of observation, will easily appear by a study of the following little table:

Velocity.	Resistance by Munich Expm'ts	Resistance by the writer's formula, for 20-car loaded trains.	Resistance by D. K. Clark's formula.*
Miles per hour.	Lbs. per ton.	Lbs. per ton.	Lbs. per ton.
0	5.0	4.0	7.0
10	6.7	4.8	7.7
20	19.0	7.1	9.3
30	52.2	10.9	12.1
40	117.0	16.3	15.9
50	223.7	23.3	20.9
60	383.0	31.7	26.9
70	605.2	41.7	34.1

* D. K. Clark's formula is $R = \frac{v^2}{171} + 8$ for tons of 2,240 lbs., or $R = \frac{v^2}{181.5} + 7.14$ for tons of 2,000 lbs.

The writer's formulæ are given hereafter in this paper.

The full extent of the contrast in this table will be seen at a glance on the accompanying diagram (Fig. 2), taken from the writer's report on his experiments (Trans. Am. Soc. C. E., Feb., 1879), with the curve for the formula given by Baron von Weber added.

A few words in addition to the above will sufficiently indicate that the Bavarian formulæ are entirely inadmissable for any class of rolling-stock.

Applying the formula to high speeds, an ordinary passenger engine with 40,000 lbs. on the drivers and an adhesion of one-fourth will move on a level only 131 tons at 30 miles per hour, 25 tons at 40 miles per hour, and barely its own weight at 45 miles per hour!

Again, taking a low speed, a train descending a grade of 0.70 per 100—14 lbs per ton (of 2,000 lbs.) accelerating force—will never attain, according to the formula given by Baron von Weber, a greater velocity than about 17¼ miles per hour!* Yet in all the writer's experiments, which were

*A full account of these experiments, which the writer was enabled to make by the kindness of Mr. Chas. Paine, General Superintendent, will be found in the Transactions of the American Society C. E. for February, 1879.

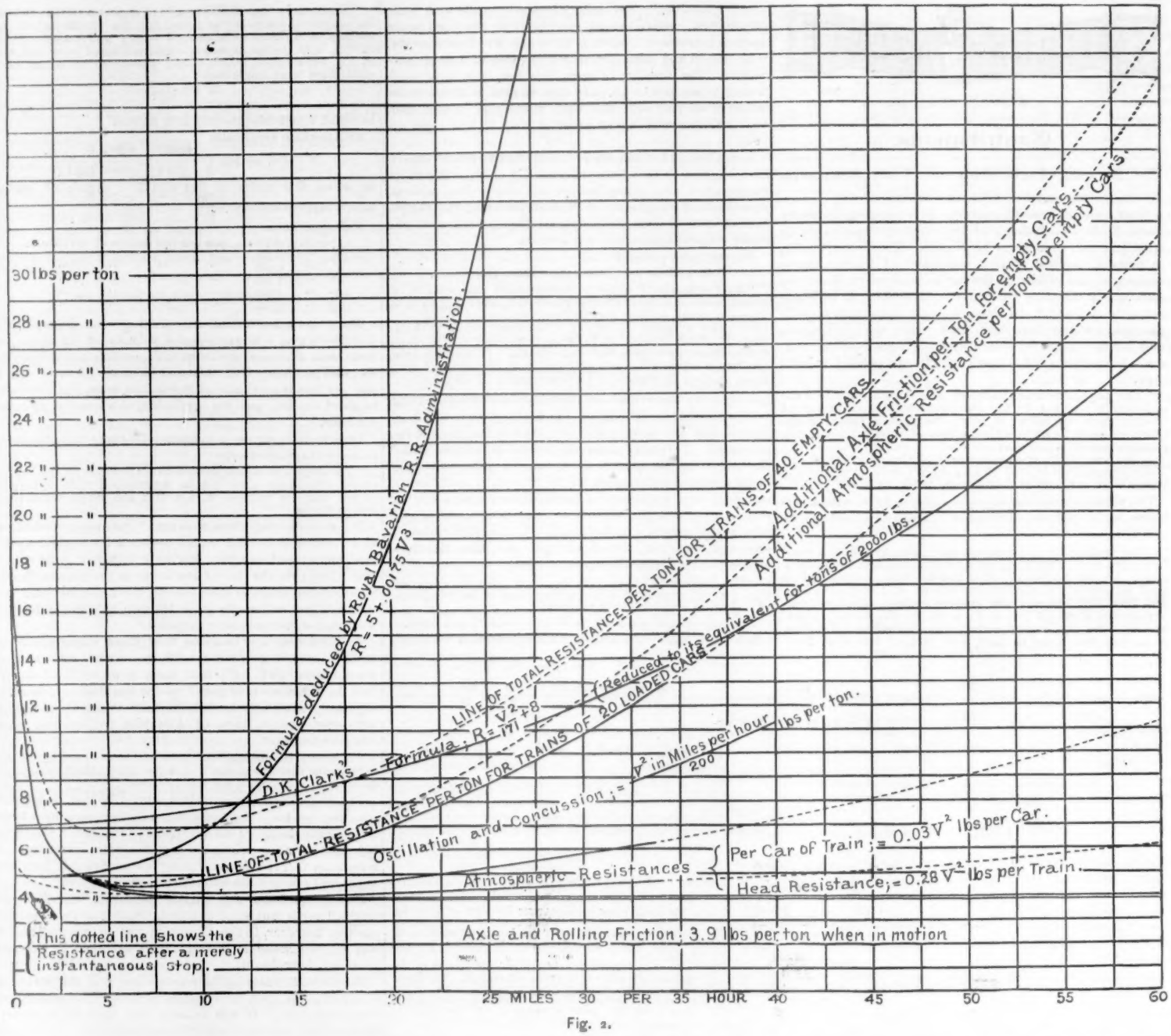

30 lbs per ton
28 " — "
26 " — "
24 " — "
22 " — "
20 " — "
18 " — "
16 " — "
14 " — "
12 " — "
10 " — "
8 " — "
6 " — "
4 "
Formula deduced by Royal Bavarian R.R. Administration.
R = 5 + .00175 V3
D.K. Clark's Formula; R = V2/171 + 8
LINE OF TOTAL RESISTANCE PER TON FOR TRAINS OF 40 EMPTY CARS.
Additional Axle Friction per Ton for empty Cars.
Additional Atmospheric Resistance per Ton for empty Cars.
(Reduced to its equivalent for tons of 2000 lbs.
LINE OF TOTAL RESISTANCE PER TON FOR TRAINS OF 20 LOADED CARS
Oscillation and Concussion; = V2/200 in Miles per hour lbs per ton.
Atmospheric Resistances { Per Car of Train; = 0.03 V2 lbs per Car. Head Resistance; = 0.28 V2 lbs per Train.
This dotted line shows the Resistance after a merely instantaneous Stop.
Axle and Rolling Friction; 3.9 lbs per ton when in motion
0 5 10 15 20 25 MILES 30 PER 35 HOUR 40 45 50 55 60

Fig. 2.

made on a track of that grade, trains of one to five cars, even when empty, attained a velocity of 24 to 30 miles per hour within the length of the test track (6,400 feet), and the velocity in every case was still increasing. According to the Bavarian formula, it would require a grade of 2.61 per 100 (138 feet per mile) before even a long and heavy train would acquire this velocity !* Nothing less than 19 feet per 100 (*over one thousand feet per mile*) would suffice to give a velocity of 60 miles per hour !

The existence of a grave error, therefore, far too great to arise from differences of rolling-stock, must be admitted.

The origin of the error is, it is thought, equally plain from internal evidence in Baron von Weber's summary. It lies simply in the fact that *formulæ deduced from tests of single vehicles were combined together without modification and assumed to be applicable to whole trains.*

We are told that the tests were made with cars "singly and in combinations, mostly three together" —equivalent to one and a half of our cars. This, therefore, appears to have been about the maximum "train" experimented with; a conclusion which is strengthened by the fact that no allusion is made to the effect of the number and load of the cars upon the coefficient of velocity-resistance in any part of the summary. Yet, it is evident that air resistance, at least, must be greatly affected *per ton* by the length of the train and by the load, and this was invariably found to be the case in the writer's experiments, which were made with trains of one to five cars (equivalent to ten of the Bavarian type), both loaded and empty, and both box and flat. Tests of *single empty box-cars* (equal to two Bavarian cars) correspond very closely with the Bavarian formula up to speeds of 15 miles per hour and explain its probable origin, but the resistances were so greatly modified by variations in the number, *kind and load of cars* that the writer judges it impossible to deduce correct formulæ from any number of tests, however great, made without this variation in conditions, and he felt obliged to express his own conclusions as to train-resistance formulæ as follows :

"From the formulæ just given (for the separate elements of train resistance, as atmospheric, oscillatory, etc.) we may construct an equation which shall be correct within (it is hoped) a small margin of error, *for any one train*, but it is plain that no general formula can be devised which shall be even approximately correct for all classes of trains. If we estimate those locomotive resistances which are a tax upon the adhesion (thus excluding all internal friction and the axle friction of the drivers) as approximately the same per ton as for the train, viz.: 4 lbs. per ton (and probably no simple assumption would be so nearly correct), we shall obtain the following equations of resistance for various trains.

These formulæ are believed to be closely approximate up to velocities of 30 miles per hour. No tests were made at higher velocities."

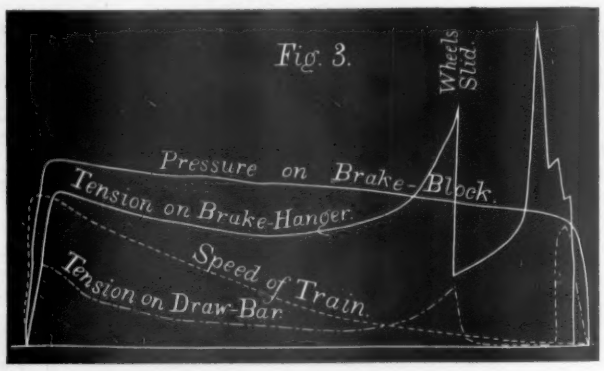
Possibly the Bavarian formulæ were not intended to apply to other than *disconnected* locomotives and vehicles, but if so Baron von Weber's language is very deceptive, wherein he speaks of formulæ being framed with reference to "combinations of cars and also of locomotives, coming nearer to an actual railroad train than single cars."

It may be admitted then that, if the vehicles of a train be tested *disconnectedly*, and this test taken as fair for the train coupled together, the result will be a formula approximating to that quoted by Baron von Weber up to speeds of 15 miles per hour. But above that speed, the latter formula speedily runs above the limits of possibility even for single empty cars. This indicates that the formula is erroneous in form as well as in its constants, and a few words will point out where the error lies (in the writer's opinion), and how it arose. This can be best done in connection with the statement given as to the effect of velocity on curve resistance, viz.:

"If we designate the increase of resistance on curves, in opposition to that on straight lines, as *additional resistance*, we obtain the important law—at least within the limits of the speeds applied in these experiments—that *the additional resistance is* INDEPENDENT OF THE SPEED."

The writer's conclusions were that "the resistance of curves *decreases materially* with the velocity and appears to be greater by a considerable percentage in the first 200 to 500 feet thanon the rest of the curve."

Which of these statements is correct is a matter of real importance for the "rational location of railroads" if for nothing else. We will, therefore, summarize, *first*, the existing independent evidence lending support to the writer's conclusions, and *secondly*, the probable origin of the assumed error in generalizing the Bavarian experiments.



20 loaded box cars	$\frac{V^2}{130}+3.9$			20 loaded flat cars	$\frac{V^2}{113}+3.9$		
30 " "	$\frac{V^2}{136}+3.9$			30 " "	$\frac{V^2}{117}+3.9$		
40 " "	$\frac{V^2}{140}+3.9$			40 " "	$\frac{V^2}{120}+3.9$		
30 empty "	$\frac{V^2}{100}+6.0$			30 empty "	$\frac{V^2}{78}+6.0$		
60 " "	$\frac{V^2}{106}+6.0$			40 " "	$\frac{V^2}{81}+6.0$		
50 " "	$\frac{V^2}{109}\times 6.0$			50 " "	$\frac{V^2}{82}+6.0$		

* The formula being

$$R = 5 + .00175\ V^3$$

substituting for R its maximum value, 14, we have

$$V = \sqrt[3]{\frac{14-5}{.00175}} = 17.26 \pm$$

Conversely, if the velocity be 30 miles an hour, the resistance as given in the table above, would be 52.2 lbs. per ton (2000 lbs.) by the Bavarian formula, = 2.61 per 100, which is hence the grade required to give that velocity.

Extrinsic evidence that curve resistance must increase with decrease of speed: Capt. Douglas Galton's and Mr. Geo. Westinghouse's experiments on brake friction, which were unique in the delicacy and excellence of their appliances, prove positively that the co-efficient of friction between rail and wheel increases with decrease of speed, and that this increase is very much more rapid at very low speeds. The diagram herewith (Fig. 3) gives a fair type of the diagrams taken and shows this fact very clearly.* Now the slippage of wheel on rail in running around a curve takes place at a very slow speed, viz. About one foot for each 24° of curvature, or on a 10° curve (174 metres radius) at a velocity of 20 miles an hour, at the rate of one foot in eight seconds. Why then should it be exempt from the same law? Moreover, Prof. R. H. Thurston's experiments on axle friction† prove that the same law holds with axle friction, contrary to the previously stated facts on the subject as laid down in Morin's and other early experiments. Other, and as yet unpublished, experiments of the writer on journal friction at very low velocities—made with a more perfect apparatus than Prof. Thurston's for that particular purpose—prove positively that the co-efficient of axle-friction at velocities of zero *plus* is extremely sensitive to minute changes.

These facts seem sufficient to establish a presumption that the co-efficient of curve friction is higher at low volocities; a presumption which is entitled to credit, if the error in generalization can be pointed out by which a contrary conclusion was reached by the Bavarian experimenters.

The error lies, the writer thinks, in the erroneous assumption that the straight-line resistance varies as the *cube* of the velocity instead of the *square*, and that error probably arose as follows:

The axle friction proper, which is nearly constant at higher velocities than eight miles per hour, is subject to an irregular and abnormal increase as the velocity falls below this,‡ giving the peculiar form to the curve of resistance shown at the left of the accompanying diagram. No single formula will correctly represent the resistance at ordinary working velocities, and also at very low velocities, but the practical effect of this fact, in making experiments like those at Munich, *all at low velocities, and most of them at very low velocities*, is to make *it appear that* the resistance increases very slowly indeed up to eight or ten miles per hour, and very rapidly beyond that, up to 20 miles per hour or thereabouts. If then these various tests be compared by the "method of least squares," a cubic parabola will approach nearer than any other single formula to being in harmony with them.

This law, however, will not hold if *any considerable number* of tests were made at higher velocities, even so low as the highest mentioned by Baron von Weber, 20 to 27 miles per hour. The writer, therefore, predicts with a high degree of certainty that but few tests were made at higher velocities than 15 miles (25 kilom.) per hour, and that those few in every case fell below the indications of the formula deduced by a too rigid application of the "method of least squares."

When it came to tests on curves, the extra resistance follows the same law, viz., increases rapidly at low velocities. Hence the observed resistances would, in this case also, increase very slowly at first and very rapidly afterward, and would "fit" a cubic parabola better than anything else up to 20 miles per hour, and apparently confirm the correctness of a "cubic" formula. Beyond that speed, however, they would not "fit" at all and the writer risks little in predicting that they did not and do not.

An attempt to demonstrate this with more detailed exactness would be too technical for your columns. That it is presumably correct, is evident from the patent fact pointed out in the beginning that the formulæ quoted by Baron von Weber are entirely inadmissible for any class of vehicles at the higher velocities.

A. M. WELLINGTON.

* A full report of these experiments has been published in the *Railroad Gazette* and *Engineering*, and may also be found in "The Pennsylvania Railroad" by James Dredge, p. 250.

†See "Friction and Lubrication," by R. H. Thurston, *passim*.

‡The following expresses the writer's conclusions as to this increase at low velocities:

"The initial resistance at the instant of starting is several times greater than the normal axle friction when once in motion, and greater for loaded than for empty cars, being at least 18 lbs. per ton for loaded cars, and 14 lbs. per ton for empty cars, as an average, but fluctuating considerably.

"Most of this initial resistance is almost wholly instantaneous and consumes little power. Enough of it still remains, however, to increase the normal axle friction in the first few car lengths by at least 2 lbs. per ton. This, of course, does not include, nor in any way refer to, the additional power demanded to get up speed, which is 2 lbs. per ton to give a speed of 10 miles per hour in 3,340 feet, or 4.5 lbs. per ton to give a speed of 15 miles per hour in the same distance."

Long Beach.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Less than three months ago the inhabitants of East Rockaway—a little oyster-planting hamlet in the southern part of the town of Hempstead, on Long Island—were considerably agitated over the advent of an engineering corps in their midst, whose avowed purpose was to "run a line to Long Beach," and perhaps build a railroad there. Now, Long Beach was to these simple villagers a barren strip of sand, which formed a barrier against the ocean on their southern boundary, and which stayed its stormy encroachments upon their salt marshes, or "mashes," as the natives term those great expanses of mud and salt water. Few of the younger inhabitants knew of the existence of Long Beach at all, except from hearsay, but the older ones, who had been there, shook their wise heads and eloquently argued with the engineer the utter impossibility of building a railroad across "those mashes," because at some previous period some man had been lost in the mud, which, in their opinion, was immeasurable, and, like the infernal regions, a bottomless pit, and without foundation. Long Beach itself was described as shifting from year to year, a sort of moving panorama of sand-hills and clams, with a dash of life in the shape of a government station for saving the victims of shipwrecks. Such were the cheering expressions freely lavished upon the engineer corps as they pursued their work through the salt-holes and "mashes," bound for Long Beach. Col. Sharp, whose unerring judgment had overcome many more serious tasks, was satisfied, and under his direct supervision the work went on. Day by day the line of the proposed railroad was laboriously and painfully traced through the mud and over the treacherous bogs, where a miss in his footing would send an unfortunate "peg-driver" over his ears in mud and water, until Long Beach was reached. That day is not easily forgotten; in itself a spring day, one of the first warm, soft days that come upon us so gently that we hardly notice the transition from winter's cold and harshness to mild, ethereal spring. We were not in view of the ocean until we had ascended a gentle incline, when suddenly it burst upon our vision in more than ordinary beauty and magnificence, as far as the eye could scan one gentle, undulating expanse of clear blue water, rivalling the very heavens in depth and purity of color. To the east a long, low, clearly-defined line of dazzling whiteness showed the outlines of a beach, consisting of clear, clean sand, upon which the white-capped breakers advanced and receded with an even, murmuring sound as unlike a roar as is the low, chanting lullaby of a mother to her babe. With one voice we suspended our vocations as engineers and formed ourselves into an idle exploring party and wandered up the beach, eagerly drinking in the delicious salt air which was wafted us from the ocean. For nearly five miles we walked on a beach as hard and smooth as a parlor floor, the imprint of our heels being barely discernable as we walked along, picking up here and there a fine specimen of sea-weed or a brilliantly-colored shell. Only the waning daylight recalled us to a sense of our duty, and regretfully we retraced our steps, and again plunged through the creeks and numerous bayous, across whose surface we were commissioned to build a railroad to carry easily and safely the poor, jaded, over-worked souls to revel in the glories of old ocean. To-day the engineer's work is done, the railroad is built, six miles across the marshes, with over two miles of trestle-work, a handsome specimen of double-track railroad, built in the most approved style. At the junction of this branch with the Brooklyn & Montauk Branch of the Long Island Railroad, the switches are all manipulated by the Saxby & Farmer interlocking apparatus, similar to that in use on the London & Northwestern Railway, in England. This is considered necessary to avoid any possible chance of collisions between the numerous trains which will run from Long Beach to New York. On the beach itself, on the very spot where we first obtained that glorious view, now stands a magnificent structure, the Long Beach Hotel, a building which, taken in all its appointments, now nearly finished, will rival any hotel in Europe or America. The main building is 900 ft. long and 150 ft. wide, with a large piazza all around the house 25 ft. wide. The structure is more remarkable for its capacity and architectural beauty than for any colossal proportions. The first floor is occupied with cafés, lavatories and retiring rooms, together with the necessary offices. In the centre of the building is an immense restaurant 175 ft. by 80 ft., and on each side are two corridors, each 50 ft. wide, running across the building from north to south. Another corridor, 50 ft. wide, runs along the centre, crossing these two and communicating with the café on the east and the restaurant on the west. All the necessary serving rooms are provided to accommodate and wait upon 5,000 people at the same time. The working departments are in the basement. In the centre, grouped around a brick shaft, 25 by 20 ft. and 90 ft. high, are all the kitchens, laundries and offices that produce either heat or odor. At the base of the shaft are fans driven by steam to bring in fresh air and drive out foul. A track enters the building at the northwest corner, and running under the north porch distributes all the supplies at their various headquarters. Ice, meats, vegetables, milk, beer, fuel, all have their allotted places and are kept cool and clean. On the second floor are parlors, dining-rooms and public rooms for the guests of the house; also select parlors and sleeping-rooms; the third floor is the same size as the second, less the porches, and contains sleeping-rooms, baths and lavatories. The fourth floor is composed entirely of sleeping-rooms, making in all about 300 bed-rooms, with the necessary parlors, dining-rooms and accessories. Pure fresh water is brought from the main land at East Rockaway, through 6-inch pipes, from a well forty feet in diameter. A music pavilion, bath-houses and all the adjuncts to a first-class seaside hotel, are completed, and in addition to the hotel are sixteen beautifully finished cottages, fully furnished, and complete in every detail. There is also a large livery-stable for the accommodation of such gentlemen as care to take their horses, the hard smooth beach making driving a delightful recreation.

The grading of the railroad was done by Mr. H. C. Moore, Master of Road of the Long Island Railroad, and the piling and bridging by Mr. C. McLean, Master of Bridges and Buildings of the same road. The hotel was designed by Mr. Bruce Price, architect, of New York. All these gentlemen deserve credit for the remarkably quick time in which the work has been performed, but the one whose indefatigable perseverence and inflexible will worked all those wonders in so short a time and against such tremendous disadvantages is Col. Thos. R. Sharp, the President of the company, the very same man who took hold of the Long Island Railroad when it was reduced to almost nothing but a right of way and a charter, and has raised it to the dignity of its present position.

* * * * * * *

Heavy Tank-Locomotives for Freight Service.*

It seems to be the general impression that the plan for tank-locomotives, which has been devised by Mr. M. N. Forney, and which is so successfully used on the New York Elevated and many other roads, is adapted only to light locomotives. To show that this impression is erroneous, and that the system can be used for very heavy engines, suited for freight service, where great power is required, he has made the designs represented by the engravings herewith. Fig. 1 is a side elevation, and figs. 2 and 3 alternate plans, which will be described further on.

The advantages which are secured by this system have been so often described by its originator, that it seems hardly necessary to repeat them. It may be said, though, that what is claimed for the plan is, that the whole weight of the boiler and machinery, which is unchangeable, is carried on the driving-wheels, while the supply of water, which is variable, is carried on the truck. The whole weight of the parts resting on the driving-wheels is thus utilized for producing adhesion. Extending the frames beyond the fire-box so as to receive the water-tank, and then supporting the latter on a truck, gives a long and flexible wheel-base, and these engines are consequently remarkable for their steadiness, while their great tractive capacity, in proportion to their size, always excites surprise.

With the arrangement described, it is necessary, in order to guide the engine around curves, to run it with the truck and the tank in front, and the chimney behind, as is indicated by the position of the cow-catcher in the engravings. The importance of having the truck in front increases, though, with the length of the wheel-base. The smaller-sized engines of this kind are run either way without any practical difficulty, and those on the New York Elevated Railroad are never turned. In engines as large as the one represented by figs. 1—3, though, it would be preferable to have the truck to guide them, as is the practice with ordinary locomotives.

From fig. 1 it will be seen that in this design six driving-wheels are used and a six-wheeled truck. The water is placed on the latter and the fuel at the middle of the engine. The tank has a capacity of 2,000 gallons, which could be increased somewhat if desirable.

The Walschaert valve-gear has been adopted on account of the convenience with which it can be located in an engine of this kind with six driving-wheels, and the difficulty of using a link motion. The fact, too, that this gear is all outside and accessible is not the least of its advantages.

The following are the proposed dimensions of this engine:

Gauge of road	4 ft. 8½ in.
Weight of engines, with full supply of fuel and water, estimated	108,000 lbs.
Weight on driving-wheels, estimated	72,000 "
Diameter of driving-wheels	48 in.
Diameter of pistons	20 "
Stroke of cylinders	20 "
Distance from centre of truck to centre of extreme driving-wheel	21 ft. 6 "
Distance from centre to centre of extreme driving-wheels	9 "
Length of grate	62 "
Width of grate	42 and 68 "
Outside diameter of smallest boiler-ring	51 "
Number of tubes	160
Diameter of tubes	2 in.
Length of tubes	12 ft.
Square feet of grate-surface	26
Square feet of heating surface in fire-box	126.6
" " " " in tubes	1005.0
Total square feet of heating surface	1131.6
Capacity of tank	2,000 galls.

It has recently been remarked by one of the oldest locomotive-builders in the country, that what is known as the American type of engine had outgrown itself, which, with a 4 ft. 8½ in. gauge, is undoubtedly true. The same remark would also apply to heavy, ten-wheeled mogul and consolidation locomotives. For the larger sizes of such boilers of over 50 in. in diameter are no longer rare, and as it is impossible, with the ordinary method of construction, to make a fire-box more than about 43 in. wide on the outside; it therefore appears contracted, so that when a wagon-top is used the back view is like fig. 4,

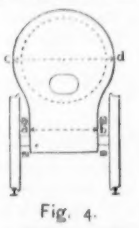


Fig. 4.

and it reminds one of a stout woman tightly laced. The vital organs of the locomotive in such cases, as well as those of the woman, are compressed into too small a space to act with the utmost vigor. The fact that it is impossible, with the plans generally in use on standard 4 ft. 8½ in. gauge roads, to make fire-boxes wide enough for the increased and increasing size of locomotives has of late been forcing itself on the attention of locomotive-builders and superintendents. To get the required grate-area, and to increase the space inside of the fire-boxes, with their present width, the latter are often made very long, and in some cases they have been lengthened so much that it is difficult for firemen to throw coal on the fire, or work it at the further end of the grate. To lengthen the fire-box of a tank-engine of the plan described would extend the wheel-base too much, so that the only way to increase the size of the former is by widening it. This has been done in some cases on narrow-gauge engines,

* The engravings and the greater part of the article following, are reprinted from a pamphlet just issued by Mr. M. N. Forney.

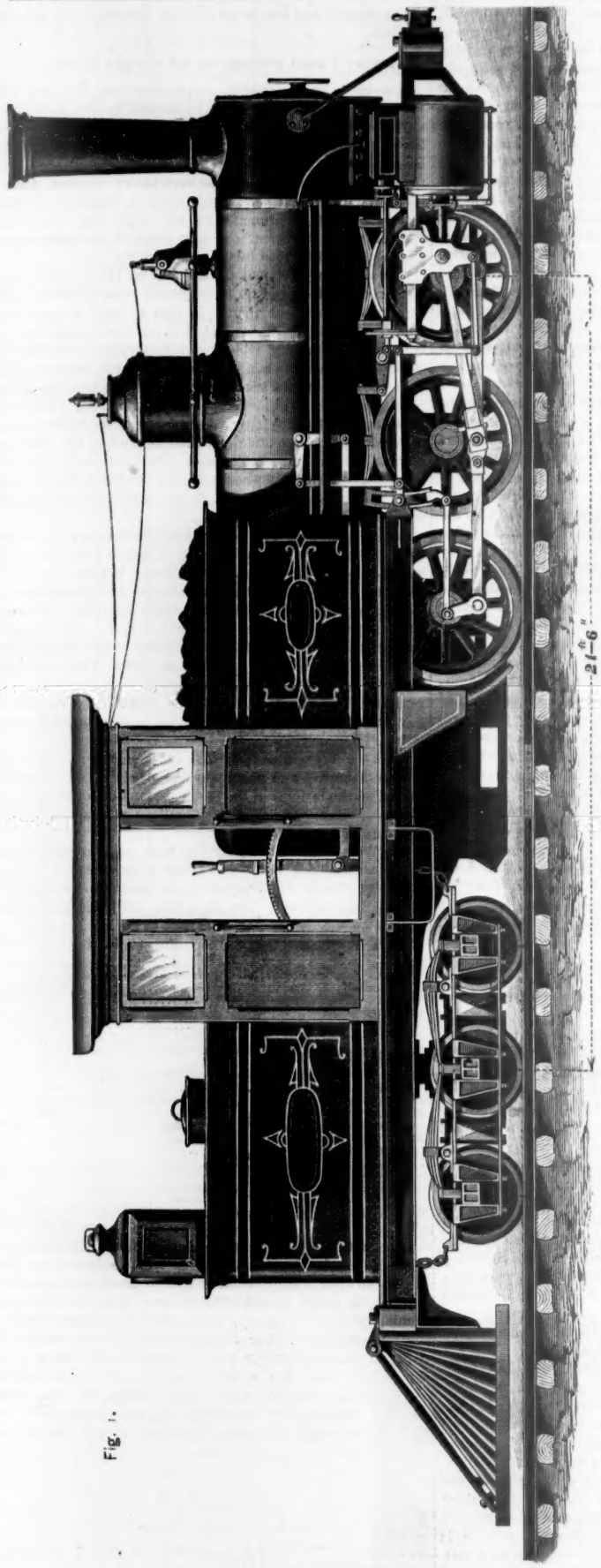


Fig. 1.

DESIGN FOR HEAVY, TWELVE-WHEELED, FREIGHT LOCOMOTIVE.
By M. N. Forney, Mechanical Engineer.

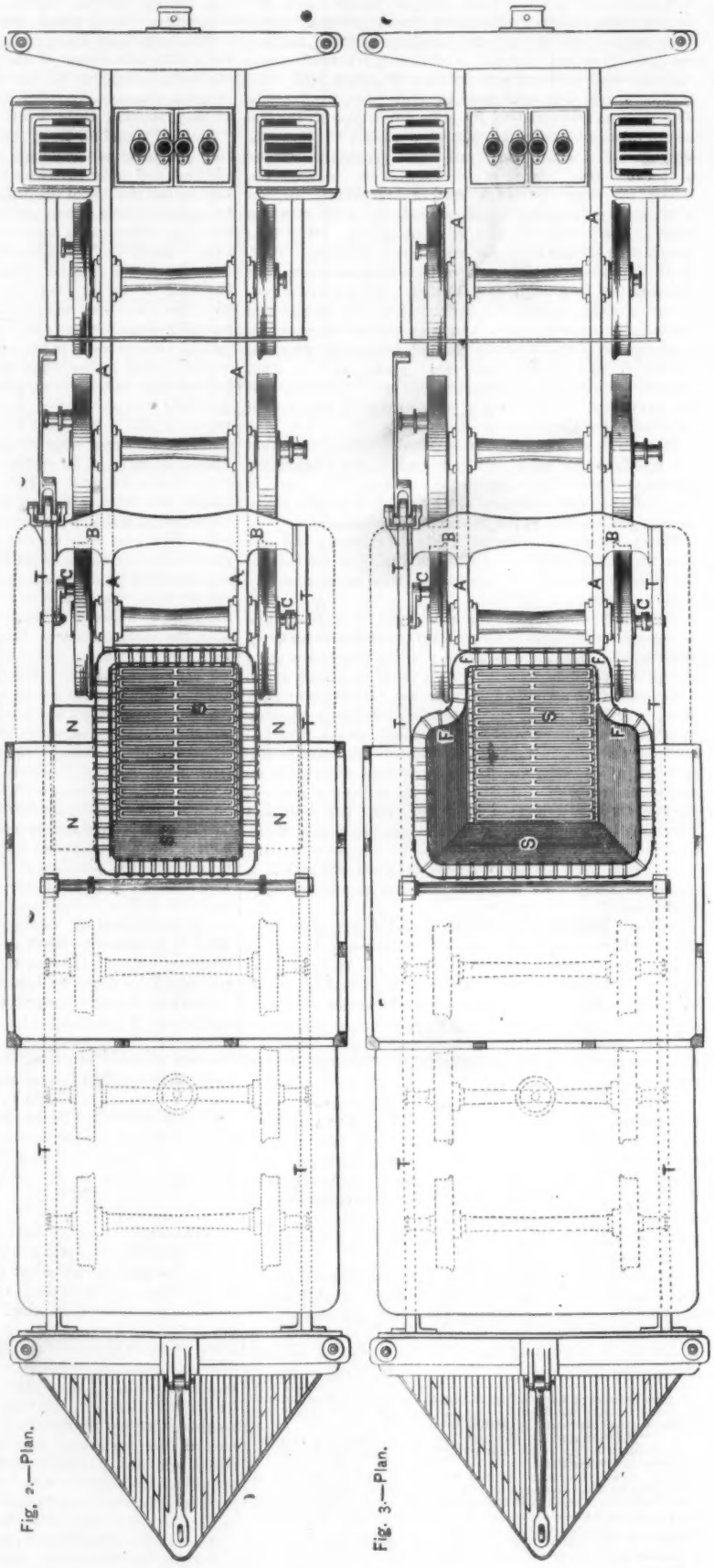


Fig. 2.—Plan.

Fig. 3.—Plan.

as indicated in fig. 6, that is, a cross-bar, *B B'*, is attached to the front of the fire-box, but back* of the wheels. The distance from the centre of the back driving-axle to the front of the fire-box is thus somewhat greater than the semi-diameter of the wheels. It is apparent that, if the fire-box had been brought up near the axle, the whole engine could have been shortened by an amount nearly equal to this distance, which, if large wheels are used, would be a matter of considerable importance. For this reason the plan represented by figs. 2 and 3 was devised. By reference to fig. 2, it will be seen that, if the fire-box had been brought close up to the axle, it would have been impossible to place the cross-bar behind the wheels and in front of the fire-box. For this reason it was attached to the frames, *A A*, in front of the back driving-wheels, and the tank-frames, *T T*, were placed outside of them far enough to clear the crank-pins, *C C*, and the cross-bar is high enough up, as shown in fig. 1, so that the connecting-rods will not strike it. The fire-box, *S S*, is then made the full width between the wheels, as shown in fig. 2. It will be noticed, though, that this leaves spaces, *N N*, between the fire-box and the tank-frames, *T T*, which must be filled by castings or distance-pieces, in order to attach the tank-frames to the fire-box. As these distance-pieces serve no useful purpose, it was thought the fire-box might as well be carried out and occupy that space, as shown in Fig. 3, and the tank-frames could then be attached directly to it. This arrangement, it will be seen, gives an area of grate, in a given length, with about 75 per cent. more surface than could be secured if the ordinary method of construction was adhered to, and the fire-box was confined to the widths between the frames *A A*.

This form of fire-box, shown in the plan, fig. 3, besides the increase in capacity and grate-area which it gives, also has the advantage that the bend in the plates at *F F* permits them to expand longitudinally. One of the most serious difficulties with fire-boxes, and a prolific cause of expense, especially if steel plates are used, is the cracking of the side plates. When this occurs the fracture is, in nearly all cases, in a vertical line, and is undoubtedly due to the expansion and contraction of the boiler by changes in temperature to which it is exposed. When the sides of the inner fire-box are straight, as in fig. 2, and it is rigidly attached by stay-bolts to the back end of the shell, and to the tubes at the front end, it is evident that there is no opportunity for longitudinal movement when the tubes and side plates are heated to a higher temperature than the outside shell, and consequently these plates are subjected to great strains. If the side plates are made of the form represented in fig. 3, with a bend at *F F*, as shown, it is evident that it would be impossible for any changes of temperature to subject them to very great longitudinal strain, because the plates would spring, without injury, at the bend more than they would be elongated by any degree of heat to which they could be exposed. For this reason it is thought that this form of fire-box will prevent, to a very great extent, if not entirely, the cracking of the side plates, at least from the causes named, while at the same time the area of the grate and capacity of the fire-box are about 75 per cent. greater if made of this form than they are if constructed in the usual way.

For heavy locomotives of great capacity this form of construction has very great advantages, and by using it the general plan or "system" of tank-engine which has been described is applicable to the heaviest class of engines—a design for which is represented by the engravings—as well as to the lightest.

The advantage of using heavy locomotives, and hauling large trains, can be shown by a few figures which were pro-

* The terms front and back are used in their ordinary sense, the chimney being supposed to be at the front of the locomotive.

Fig. 5.

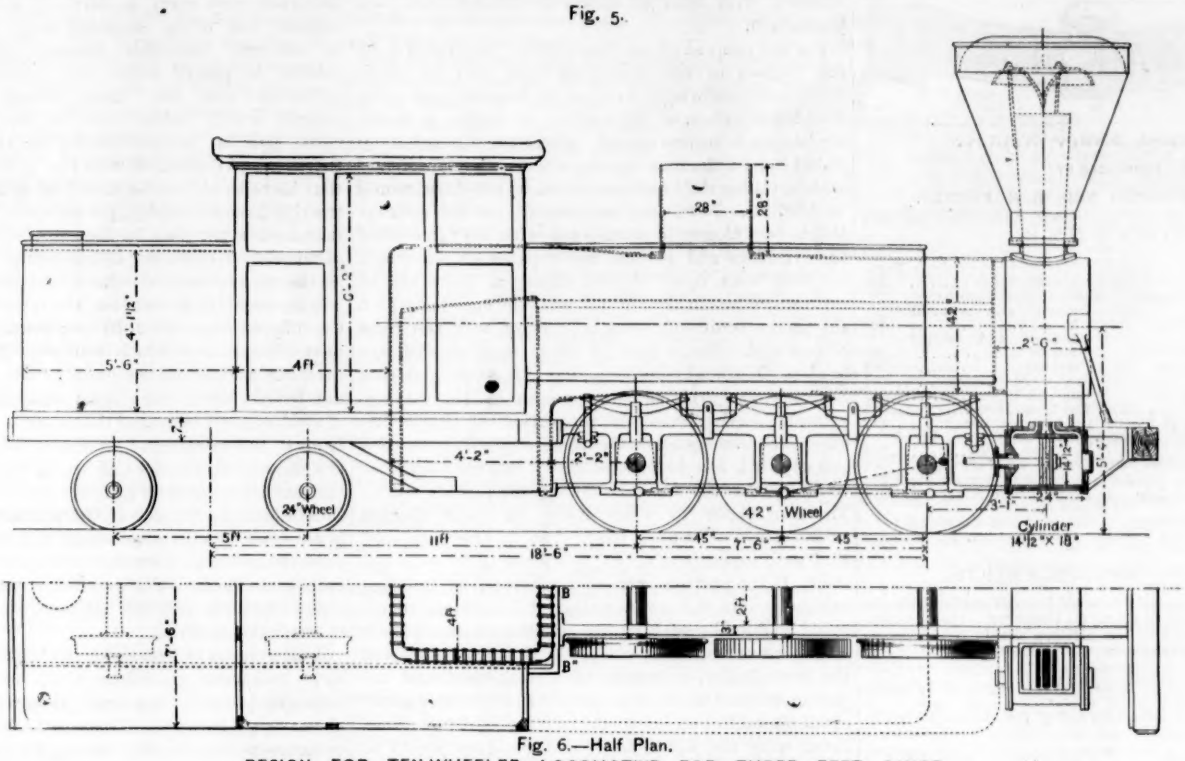


Fig. 6.—Half Plan.

DESIGN FOR TEN-WHEELED LOCOMOTIVE FOR THREE FEET GAUGE.

Fig. 7.

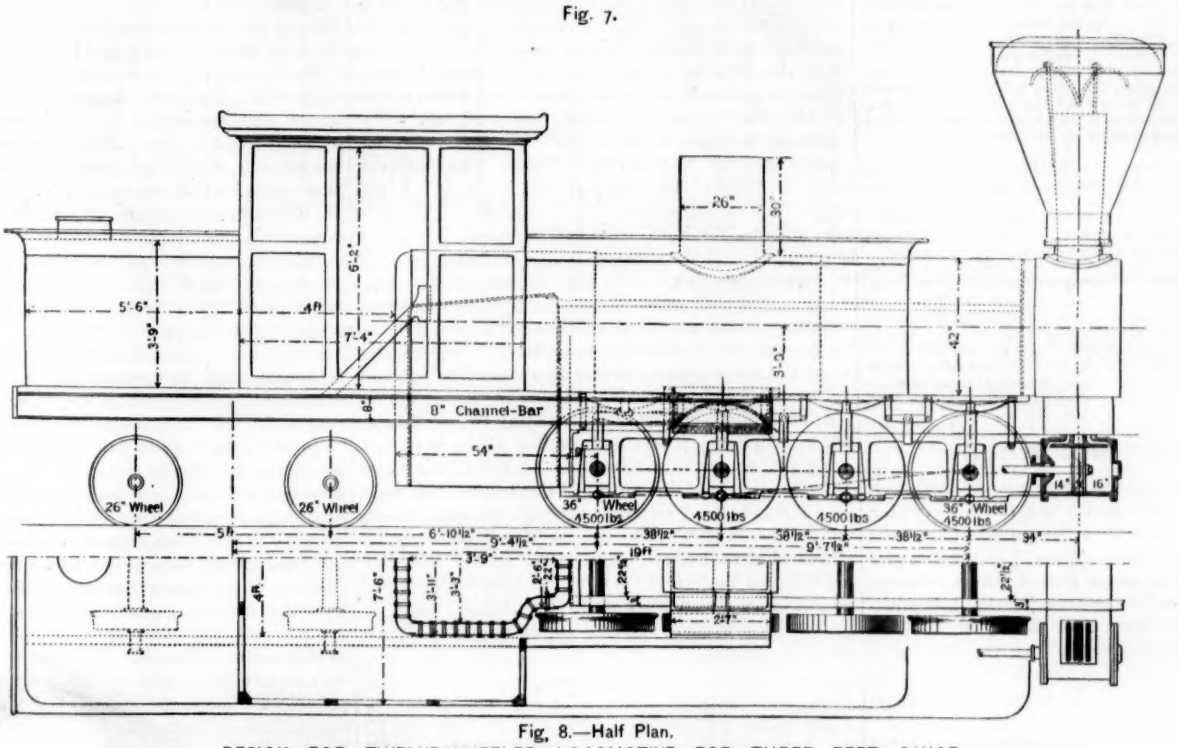


Fig. 8.—Half Plan.

DESIGN FOR TWELVE-WHEELED LOCOMOTIVE FOR THREE FEET GAUGE.

cured from a line that at present is moving about 10,000 cars per month, or 120,000 per year, each way, over its road. These cars are hauled with American engines, with from 12,000 to 14,000 lbs. of weight on each of four driving-wheels, and the average train-load is 26 cars. The cost of train-service of each train for a round trip of a little over one hundred miles, over one section of its road, is as follows:

Locomotive runner	$3.46
Fireman	1.80
Conductor	2.25
Three brakemen, at $1.80	5.40
Total	$12.91
Cost of train-service per car, per round trip	49.65

As the division referred to is just about one-fourth of the whole line, the total cost for train-service per year, for the latter, would be $238,320.

If, now, locomotives having six instead of four driving-wheels were employed, with the same weight on each of them that is carried on the engines now in use, and if they were otherwise properly proportioned, they would pull 50 per cent. more load, or trains of 39 cars, and in that case the cost for train-service would be as follows:

Locomotive runner	$3.46
Fireman	1.80
Conductor	2.25
Four brakemen, @ $1.80	7.20
Total	$14.71
Cost of train-service per car	37.72
Cost of train-service per year for the whole line	181,826.00

The saving in the item of train-service alone would therefore be:

	$238,320.00
	181,826.00
	$56,494.00

There are other items, such as the consumption of fuel, oil and waste, cost of cleaning, housing and repairs of engines, which would undoubtedly be diminished, because two of the large engines would not cost so much to maintain as three of the smaller ones. It is impossible to give these items of expense with the exactness with which the train expenses can be specified; but some illustrations can be given to show that there *must* be a material saving. Thus, in the one case, three head-lights will be needed instead of two. The same is true of whistles, bells, sand-boxes, steam-gauges, gauge-cocks, cylinder-cocks, oil-cocks, heater-cocks, blow-off cocks, cab, cow-catcher, signal flags and lanterns, tools and tool-boxes, and, in short, a great many of the parts need be no larger for one-sized engine than for another, and their first cost and cost of maintenance is therefore in proportion to the number of engines. Other parts are very slightly influenced by the increase in size of the locomotive, and consequently a very important saving is effected if we diminish the number of engines and the number of these parts in like proportion.

The saving referred to above can be affected by an engine of large capacity, and is due to the reduction in their number and the number of trains to do the same work, and this advantage is one which locomotives like that illustrated in figs. 1—3 have in common with all others of equal capacity. In addition to this, tank-locomotives of this kind have the advantage of being simpler machines, and of having a greater capacity in proportion to their weight than any other class of engine. Thus, two locomotives like that illustrated in fig. 1 would do the same work as three ordinary American engines and tenders. In the one case there would be 12 axles, 24 wheels and 2 trucks. In the other there would be 24 axles, 48 wheels and 9 trucks to maintain. The weight of the three engines and tenders would be about 120,000 lbs. each, or a total of 360,000 lbs. That of the tank engines would each be about the same as each of the others, or a total of only 240,000 lbs. for the two.

Figs. 5 and 6 are sketches of a design for a locomotive with six driving-wheels for a three-feet-gauge road, and Figs. 7 and 8 represent another design for one with eight wheels for the same gauge. The latter was intended for a road laid with very light rails, on which it was necessary to carry a small load on each wheel. These plans are available whenever it is desirable to get an engine of considerable capacity, and yet not exceed a low limit of weight per wheel. Both plans afford the means of getting abundant room for the fire-boxes, which is usually the contracted part of narrow-gauge engines.

Parties desiring further information concerning locomotives of this plan may address M. N. Forney, 73 Broadway (Room 127), New York, who may be consulted with reference to them, and will furnish designs and specifications if desired.

It may be said, though, that such engines would do more injury to the track than ordinary locomotives. To this it can be replied that the maximum weight per wheel is no greater in the one case than in the other, and it is not easy to see why the rails of a road would be worn more by rolling twelve pairs of driving-wheels over the track in *two* groups of *three* pairs each, than it would to move them in *three* groups of *two* pairs each. The weight on the truck-wheels would be very little, if any, greater in the one case than in the other, and would be much less than that on the driving-wheels, and their number would be in the proportion of 12 for the latter class of engines and 36 for the other. If there is any difference, then, in the wear of the track by the wheels of either class of engine, it would be very decidedly in favor of the tank-engines.

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CONTENTS.

	Page.		Page.
ILLUSTRATIONS:		EDITORIAL NOTES	381
Train Resistances	375, 376	GENERAL RAILROAD NEWS:	
Twelve-Wheeled Freight Locomotive	378	Meetings and Announcements	383
Ten-Wheeled Locomotive	379	Elections and Appointments	383
CONTRIBUTIONS:		Personal	384
The Bavarian Experiments on Train Resistances	375	Traffic and Earnings	384
Long Beach	377	Railroad Law	385
Heavy Tank-Locomotives for Freight Service	377	The Scrap Heap	385
Narrow-Gauging the N. Y. P. & O. R. R.	382	Old and New Roads	386
EDITORIALS:		ANNUAL REPORTS:	
Locomotive Improvement	380	Vermont Valley	388
Coal Prospects	381	Louisville & Nashville	388
Movement of the Last Cotton Crop	381	Burlington & Northwestern	388
Record of New Railroad Construction	381	Providence & Worcester	388
		MISCELLANEOUS:	
		The Ethics of Railroad Expenditures	379

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LOCOMOTIVE IMPROVEMENT.

Comparatively few persons, even among engineers, seem to realize how inexorable are the laws which govern the relation, or rather the proportion, of the parts of a locomotive to each other. As the fast passenger engine, with a single pair of driving-wheels, built by the Baldwin Locomotive Works, and illustrated in our issue of May 7 of this year, and the tank locomotive described on another page represent the opposite extremes of this branch of engineering practice, a little discussion of the subject seems appropriate at this time.

The weight of the fast passenger locomotive referred to was given at 85,000 lbs., of which from 35,000 to 45,000 lbs. were on the single pair of driving-wheels—a special arrangement being provided for varying the load on these wheels. Although the weight of the tender was not given, yet, as it had a tank capacity of 4,000 gallons of water, we will probably not be very far wrong if we take its weight at 75,000 lbs., with a full supply of water and fuel. The total weight of engine and tender is therefore 160,000 lbs. If we take a mean of the weight on the driving-wheels, or 40,000 lbs., it will be exactly *one-quarter* of the total weight of engine and tender.

By referring to the weight of the tank engine, represented by figure 1 on another page, it will be seen that its total weight is estimated at 108,000 lbs., and that of this 72,000 lbs., or two-thirds of the whole weight, is on the driving-wheels.

But a still more striking case may be quoted. In our issue of June 13 of last year, a tank engine, the "Uncle Dick," for the Raton Switchback, on the line of the Atchison, Topeka and Santa Fe Railroad, was illustrated. This was said by its builders to weigh 150,000 lbs., of which 15,000 lbs. were on a pony truck, so that nearly seven-eighths of its weight was on the driving-wheels. Many tank-engines are used for switching which use *the whole* weight for producing adhesion. In the latter case there is proportionately four times as much adhesion weight as the fast passenger engine referred to has. Very naturally the question will arise, why is it that locomotives are constructed with such an enormous difference in their proportion.

For the purpose of an illustration, the case of a 30-ton engine, of the American type, will be taken, having driving-wheels five feet in diameter and cylinders 15x24 inches, of the weights of which, in detail, we happen to have a record. These engines had about 40,000 lbs. on the four driving-wheels, the adhesion of which, taking the usual coefficient of one-fifth, would be 8,000 lbs. It will also be assumed—and this assumption is very closely in accordance with the facts—that the cylinders and pistons are capable of exerting a tractive force equal to this adhesion. Let it also be assumed, whether true or not, that the speed at which the pistons ordinarily work is in every way the most economical. The weight of these engines with the tenders, in round numbers, was 100,000 lbs., so that they had *two-fifths* of their weight on the driving-wheels. As this form and proportion of engine has come into more general use than any other, in this country, it is fair to assume that it has been found to be altogether the most advantageous for the traffic. Those referred to were used for local freight traffic on a Western road. Let it be supposed that their maximum speed is ordinarily 30 miles per hour. If the problem were now presented of building locomotives to run twice as fast, it is evident that it could be done by making the driving-wheels twice as large, or ten feet in diameter. If this were done and the same boiler, cylinders, etc., were used, and the pistons worked at the same speed as before, an exactly equal amount of steam would be consumed in a given time, with the difference that the engine would be moved twice as far by each revolution of the driving-wheels, but the pistons would exert only half as much tractive power as before. Consequently, only half as much adhesion would be needed with the big wheels as with the little ones, and therefore we could dispense with one pair entirely, as was done in the construction of the fast passenger engine referred to. The adhesive weight would then be only one-fifth that of the engine and tender. But suppose that we want to increase the capacity of the engine so as to draw loads twice as great as those it was intended for, but at only half the speed. To do this the wheels might be reduced to only half their original diameter, or to two and a half instead of five feet. In that case, with the same boiler, cylinder and piston, working under the same conditions as before, the engine would run at half the speed, but the piston would exert twice the tractive power, and therefore it would be necessary to increase the adhesion in the same proportion, which could be done by adding two additional pairs of driving-wheels and loading them with the same weight as the original ones carried. As those bore two-thirds of the weight of the engine, we must load the additional ones not only with the other third, but also add a part of the weight of the tender, equal to a third of that of the engine. We should therefore have 80,000 lbs. of the 100,000, or four-fifths of the whole, on the driving-wheels. Our three classes of locomotives would therefore be as indicated in the following table:

DRIVING WHEELS	Diameter of driving-wheels	Total weight on driving-wheels	Speed of engine in miles per hour	Tractive force which can be exerted	Total weight of engine and tender	Proportion of weight on driving-wheels
1 pair	10 ft.	20,000 lbs.	60	8,000 lbs.	100,000 lbs.	1-5
2 pairs	5 ft.	40,000 lbs.	30	16,000 lbs	160,000 lbs.	2-5
4 pairs	2½ ft.	80,000 lbs.	15	32,000 lbs.	400,000 lbs.	4-5

It must be kept in mind in comparing these engines and their capacity, that they are all of the same weight, that the boilers, cylinders and pistons are of the same size, and that the latter make the same number of strokes per minute and use exactly an equal amount of steam in each case. It is simply an illustration of the well-known principle that what is gained in power is lost in speed and *vice versa*. All this is, or should be, well known, and has been stated in the above form only for the purpose of presenting clearly the real question for the discussion of which this article is written, which is, to what extent is it possible to increase the efficiency of a locomotive by a different arrangement of its parts.

Let it be supposed that we have a locomotive of the ordinary American pattern like that described and represented substantially by the engraving herewith, which has been borrowed for the purpose from our advertising pages. The weights will be assumed to be the same as those already given for the American engine, which, it will be remembered, was 20,000 lbs. on each pair of driving-wheels, and the same on the engine truck, or in other words, the driving-axles and the truck each carry a third of the weight of the engine. Let it be supposed, now, that the truck is removed, and that another pair of driving-wheels is placed under the engine, between the cylinders and the main wheels to carry the weight which before was on the truck. If the three pair of driving-wheels are then all coupled together and connected with the pistons, it is evident that there would not be sufficient cylinder capacity or tractive power to utilize the adhesion, which has been increased 50 per cent. by the addition of the third pair of wheels. To get over this difficulty, the diameter of all the wheels may be reduced one-third, the effect of which would be to increase the tractive power which the pistons can exert 50 per cent. We will then have a locomotive which will pull 50 per cent. more cars, but which will run only two-thirds as fast as it did before, when the pistons make the same number of strokes per minute and the boiler is worked as usual. It must be remembered, or rather for the purposes of this discussion it will be assumed, that the weight of our engine is limited to 10,000 lbs. per wheel. If we should increase the size of the wheels over that which is proposed, it will be necessary to add to the cylinder capacity and also to enlarge the boiler so as as to generate more steam. The problem practically is, how to make the most efficient engine with a given amount in weight of material.

As it appears at first sight, it would seem as if there were inexorable conditions which would enforce the principle, already laid down, that what is gained in power is lost in speed. There are, though, some circumstances that modify the application of this principle very materially.

Those of our readers who read the paper by Mr. Johann on "Locomotive Boiler Construction" may remember that he constructed two boilers, the one with a wagon-top, the crown-sheet of which was stayed with crown-bars, and the other with a straight top stayed with stay-bolts. The difference in the weight of these was 1,255 lbs. This difference was chiefly, if not entirely, due to the weight of the crown-bars compared with that of the stay-bolts. With locomotives of the ordinary form of construction, like the engraving herewith, this is of no importance, because they usually have too little weight on the driving-wheels, as they are located, and in fact it is very common to add heavy cast-iron footboards behind to increase the weight on those wheels. The additional material in the boiler at the back end is therefore rather an advantage than otherwise. In a locomotive arranged as is proposed, though, it is very different. In this case the speed of the engine is reduced below what is desirable, because if we add to the size of the wheels, the cylinders and the boiler, so as to increase the speed, we also add to the weight and exceed the limits to which we are confined. It is evident, then, that every reduction which we can make in the weight will permit us to add to the size and capacity of the parts referred to. It has been shown how the tractive capacity of an ordinary American engine can be increased 50 per cent., but this is done at the sacrifice of speed. Now just to the extent that we can save in weight in the construction will it be possible to make the speed of the proposed engine approximate to that of the one from which it has been developed.

Let us see, then, to what extent this can be done. If the wheels are reduced in size, their weight will, of course, be diminished, perhaps in a larger proportion than their diameters. We will assume the latter, though. Four 5-feet driving-wheels and tires weigh 10,684 lbs. If they are reduced one-third in size and weight, they will weigh 7,123 lbs., so that we have saved 3,561 lbs. Another pair of wheels and axles will be needed, though, while at the same time the truck is dispensed with. The actual saving that can be made may be presented most clearly in a tabular form, in which all additions to the weight will be placed under a column marked + and all the saving in weight in another marked —. The showing would then be as follows, the figures being all derived from the actual weight of the objects taken from a scale:

	+ lbs.	— lbs.
Saving in boiler		1,255
" " wheels		3,561
Additional pair of wheels	1,780	
" axle	493	
" " boxes	224	
" wedges (estimated)	112	
" springs-hangers, etc	347	
" parallel rods	347	
" crank-pins	80	
" counterbalances	320	
Truck		4,930
Cow-catcher, braces, etc		1,154
Head-light brackets, etc		143
Head-light		100
One-half of cab		1,049
Total	3,730	12,192

This represents a difference of 8,462 lbs., and a saving of that much in weight. This permits an increase in the size of the wheels and cylinders to an equivalent amount. It must be kept in mind, too, that in designing locomotives special attention is seldom given to keeping the weight as low as possible, and that if this object is kept in view a very considerable additional reduction could be effected.

Another element that must be taken into account in estimating the speed of engines is the proportion of the stroke to the wheel. The difficulty of running at a high speed is not in turning the wheels. A car-wheel 30 inches in diameter will run 60 miles an hour without trouble. It is the reciprocating motion of the pistons which is the source of trouble. A five-foot wheel will move 15.7 feet in each revolution, and the pistons, if they have two feet stroke, will move four feet, so that the latter have a speed in relation to the cylinders very nearly one-fourth that of the engine. So long as this relation is maintained, no matter what the size of the wheels, the difficulty of making speed will not be increased. That is, it is practicable to run as fast with 50 in. wheels and 20 in. stroke as with 5 ft. wheels and 24 in. stroke. If this is so, it therefore follows that even if it be necessary to make the size of the wheels small, on the proposed engine, the requisite speed can be attained if the stroke is only properly proportioned to that diameter.

But it will be said that if the truck be removed from an engine and a pair of driving-wheels substituted, we will lose all the advantages of a flexible wheel-base, and of having the locomotive guided by wheels which can adjust themselves to the curvature of the track. To obviate this difficulty in the system of engines illustrated on another page, the frames are extended backward far enough to receive a water-tank and are then supported by a truck underneath. This gives a long and flexible wheel-base, and by simply running the engine the reverse way to that which is customary, the truck is brought in front to guide the engine. The usual weight of a loaded tender for a 30-ton engine is 40,000 lbs. This weight can readily be carried on six wheels, as it is now very common to load such wheels with 7,000 lbs. per wheel. In the engraving, fig. 1, the fuel has been arranged over the driving wheels, because in that design no special effort was made to keep the weight on the driving-wheels within specified limits.

The position of the headlight and the cow-catcher, fig. 1, indicates why their weight was deducted from that on the driving-wheels.

What practically follows from these considerations is, that by the plan indicated it is possible to construct a locomotive *of the same weight* as one of the ordinary American type, which will have 50 per cent. more tractive power and whose speed can be made to approximate to that of the latter somewhat in proportion to the skill which is exercised in its design.

Crop Prospects.

Crop prospects continue to be watched with anxiety, but an undue amount of attention seems to be paid to Minnesota, probably because there is active speculation in the stocks of three or four railroads whose traffic depends to a large extent on the prosperity of Minnesota, which latter depends very largely on the wheat crop. It seems to be forgotten that Iowa, which is rarely mentioned among wheat producers, usually grows much more wheat than Minnesota, although wheat is not its leading crop. But the Minnesota crop is the one which is now in the most delicate situation. South of Iowa the wheat (not much spring wheat is raised so far south) is now generally all harvested, in most of Iowa probably the grain is mature and the harvest about to begin, but in Minnesota the grain is just at that stage when it can be made or ruined by a few days of favorable or unfavorable weather. Though the reports seem to have been largely manipulated in favor of speculators for a rise or fall in wheat, it seems established that in a large part of the state, including that where the population is largest and the greatest area is under cultivation (in the eastern and southern counties), there has been considerable unfavorable weather—enough to make it nearly certain that there cannot be a heavy crop, and to make it probable that a little more weather of the same sort will make the crop a very light one. The last advices are of favorable weather, and every day counts now. In the northern part of Minnesota and the Red River valley, the promise is generally of fair yield, and in many cases of a large one. Meanwhile it must be remembered that a much larger area than ever before has been sown, and that last year's crop was poor in the south and barely fair in the north part of the state.

There seems to be no doubt that the winter wheat crop has generally turned out well, and if the yield is not quite as great as last year, the area sown is very much greater, and the crop harvested is probably the largest ever known. The same is true of the California and Oregon wheat crops. The corn crop is generally extremely promising.

Hardly less important than the domestic harvest, on which traffic largely depends, is the foreign harvest, which will do much to determine prices. With regard to this the most important news, doubtless, is the bad condition of Russian crops, which with the United States is the chief source of supply for countries not growing their own breadstuffs. In Germany wheat will be less than an average, and rye, which is the chief breadstuff, much less than an average crop; France will have a much better crop than last year's, but still probably less than an average. Until very recently an average crop of wheat has sufficed for the home consumption in France, and it has exported, on the whole, about as much as it has imported. Thus the extent of its deficit last year may be judged by the fact that during 44 weeks of the last crop-year, ending June 4 last, the exports of wheat from four United States ports to France had been nearly 35,000,000, against 50,000,000 to Great Britain, whose crop also was the worst on record. The other European countries, including Great Britain, promise about average crops of wheat, and there is no prospect that there will be so great a demand as last year, while the failure in Russia makes it doubtful if the supply from exporting countries will be quite as large as it was that year, though an average crop in Austria-Hungary will add considerably to the ability of one country to export, and one which has usually been a chief source of supply to Switzerland and the South of France, and no mean one to England.

Special attention is given to the facts that are likely to govern the amount of traffic and the prices of grain in this country, because on these will depend very largely the course of rates after harvest by lake, canal and ocean as well as by rail. For three seasons past the conditions have been favorable for a heavy movement and satisfactory rates after harvest, so much so that when rates have been most demoralized before harvest they have been forced up, even without concert of action by the carriers, after harvest and until winter. Last year the rates were not advanced so fast as the year before, but still they reached a considerable advance over the present rate, and a great advance over last summer's rate, by the middle of October. With the surplus of last year's crop on hand and available, the new crop is not likely to be in haste to move, and if the price is low, it may not be practicable to secure any advance in rates until navigation closes, or near that time. But the knowledge of the firmness at which lake rates were held last winter is likely to make grain men more anxious to ship in the fall before the lakes close, and so give the lake and canal vessels a heavy traffic and profitable rates, which will tend to support if not to advance rail rates. Prices of grain are already very moderate, but this does not prevent very large rail shipments at the current rate.

Movement of the Last Cotton Crop.

The movement for the ten months' crop year from Sept. 1 to July 2 is reported as follows by the *Commercial and Financial Chronicle*, in bales:

Year.	1880.	1879.	1878.	1877.	1876.
Bales	4,832,134	4,444,540	4,243,264	3,944,758	4,064,770

By this time the crop is nearly all marketed. In 1879, the receipts to the end of June were 99.5 per cent., in 1878 97.7 per cent of the total receipts for the crop-year. So far as the receipts at different ports, etc., are concerned, therefore, the crop-year may very well be judged by the movement of these ten months. This does not hold good of exports, at least not to the same extent, as accumulations at the sea-board continue to be shipped in July and August. But in 1879 96.3 per cent., and in 1878 98.3 per cent., of the exports of the crop-year were made in these ten months.

The receipts of each leading port for the ten months since Sept. 1 for four years have been as follows:

	1879.	1878.	1877.	1876.
New Orleans	1,472,022	1,171,191	1,366,457	1,175,778
Mobile	351,370	361,488	411,930	356,786
Charleston*	478,630	514,232	457,556	468,962
Savannah	724,998	704,778	595,050	474,760
Galveston†	469,107	562,029	445,210	499,971
New York	210,577	147,540	143,001	120,680
Florida	20,141	56,428	14,270	20,379
North Carolina	102,976	134,961	142,690	128,557
Norfolk‡	725,540	558,706	506,098	550,579
Other	286,773	213,187	161,002	148,306
Total	4,843,134	4,424,540	4,243,264	3,944,758

* Charleston includes Port Royal, etc.
† Galveston includes Indianola, etc.
‡ Norfolk includes City Point, etc.

The movement this year is the largest ever known, but Mobile's and North Carolina's receipts are smaller this year than in any of the three preceding, Charleston's were larger last year, Galveston's and Florida's in 1876 and 1878. The percentage of the total arriving at each port has been:

	1879.	1878.	1877.	1876.
New Orleans	30.4	26.5	32.2	29.8
Mobile	7.3	8.2	9.7	9.0
Charleston	9.9	11.6	10.8	11.9
Savannah	15.0	15.9	14.0	12.0
Galveston	9.7	12.7	10.5	12.7
New York	4.3	3.3	3.4	3.1
Florida	0.4	1.3	0 3	0.5
North Carolina	2.1	3.1	3.4	3.2
Norfolk	15.0	12.6	11.9	13.9
Other	5.9	4.8	3.8	3.3
Total	100.0	100.0	100.0	100.0

The only decided tendency observable here is toward a decrease at Mobile and an increase at Norfolk. The business of the latter port has been almost created within a few years, and its gain serves to keep up the proportion of the South Atlantic ports.

Grouping together the percentages of the Gulf ports, the South Atlantic ports, and the other ports, we have, for the four years:

	1879.	1878.	1877.	1876.
Gulf ports	47.4	47.4	52.4	51.5
South Atlantic ports	42.4	44.5	40.4	41.6
Other ports	10.2	8.1	7.2	6.9
Total	100.0	100.0	100.0	100.0

The larger and larger movement of cotton through by rail over long routes tends to increase the receipts of Norfolk and of Northern ports.

The exports by the several ports for the ten months have been:

	1879.	1878.	1877.	1876.
New Orleans	1,380,283	1,220,426	1,437,742	1,169,297
Mobile	111,687	123,214	164,093	213,657
Charleston	344,774	383,693	305,874	344,794
Savannah	424,092	461,355	351,346	298,309
Galveston	293,801	347,006	224,434	253,816
New York	564,142	281,310	376,431	389,501
Florida		15,858		
North Carolina	35,487	65,111	56,677	36,474
Norfolk	251,185	199,640	160,691	115,515
Other	277,326	239,589	212,296	120,828
Total	3,682,777	3,346,202	3,289,584	2,945,191

It is hard to say whether New Orleans makes progress as an exporter or not; its business was seriously interrupted in 1878 and slightly last year by the yellow fever. Mobile's export business seems to be dwindling away; it was nearly twice as great four years ago as this year, though the total exports are 25 per cent. greater this year. Charleston does not vary much from year to year. Galveston gains, but does not reflect the great growth of cotton-planting in Texas, partly because last year was a season of drought and light crops, but more because of a great diversion of Texas cotton to St. Louis and the North. Savannah gains. New York has been far above its average this year, but was far below it last year. North Carolina (chiefly Wilmington) never exports much, and this year less than in any of the three preceding. Norfolk shows a steadier gain than any other port, and an increase of 119 per cent. since 1876.

The *percentage of the total* exports from each port each year has been:

	1879.	1878.	1877.	1876
New Orleans	37.5	36.7	43.7	39.7
Mobile	3.0	3.7	5.0	7.3
Charleston	9.4	11.5	9.3	11.7
Savannah	11.5	13.8	10.7	10.1
Galveston	8.0	10.4	6.8	8.6
New York	15.3	8.4	11.4	13.2
Florida		0.5		
North Carolina	1.0	1.9	1.7	1.2
Norfolk	6.8	6.0	4.9	3.9
Other	7.5	7.1	6.5	4.3
Total	100.0	100.0	100.0	100.0

This table brings out more clearly the tendency of the export business at the several ports. With regard to this and the tables of receipts, also, it should be remembered the increase in average planted has been greatest in Texas and Arkansas, and probably very little east of Alabama; but the older states keep up their cotton planting pretty well, there being not much diversion to other crops, and frequently a development of production without increase in area cultivated through the more general use of fertilizers, better cultivation, etc.

From the lost table we see that the exports have been as follows for four years:

	1879.	1878.	1877.	1876.
From Gulf ports	48.5	50.8	55.5	55.6
From South Atlantic ports	28.7	33.7	26.6	26.9
From other ports	22.8	15.5	17.9	17.5
Total	100.0	100.0	100.0	100.0

It appears, then, that the proportion of exports from Gulf ports has been decreasing, which, perhaps, was hardly to be expected, as the production of the country near those ports increases faster than anywhere else, and there is a great saving of inland transportation if its production is exported directly from Gulf ports. The loss of Gulf ports is balanced chiefly by a gain at Northern ports (New York and "other"), but partly by a small increase at South Atlantic ports. Northern ports and Norfolk also receive much cotton by long rail routes, and their gain indicates an increase in the rail movement of cotton.

Really the growth of Norfolk and the decline of Mobile exports are the most notable features in the recent history of this important traffic, unless it is the refusal hitherto for Port Royal and Brunswick exports to reach noticeable proportions. But if this traffic has done little to create new towns of late years, it has everywhere, except at Mobile, remained pretty steadily at towns where an export business has once been established.

Record of New Railroad Construction.

This number of the *Railroad Gazette* contains information of the laying of track on new railroads as follows:

Nantasket Beach.—Completed from Point Allerton, Mass., along Nantasket Beach to the Nantasket House, 4 miles.

Denver, South Park & Pacific.—Extended from Buena Vista, Col., to Hortense, 6 miles. Gauge, 3 feet.

Gulf, Colorado & Santa Fe. — Extended from Yegua Creek, Tex., north by west, to Caldwell, 22 miles.

Long Beach.—Completed from a junction with the Brooklyn & Montauk road south and east to Long Beach, N. Y., 6 miles.

This is a total of 38 miles of new railroad, making 2,228 miles thus far this year, against 1,035 miles reported at the same time in 1879, 791 miles in 1878, 710 miles in 1877, 846 miles in 1876, 457 miles in 1875, 727 miles in 1874, and 1,578 miles in 1873.

THE ST. LOUIS BRIDGE showed a considerable increase in its earnings for its last fiscal year (ending with March last), but its profits remain very light for a property which has cost about $13,000,000. Bridge and tunnel together earned net $421,272, one-sixth of which, by agreement, goes to the

tunnel company, leaving but $360,000 to the share of the bridge company, or at the rate of about 2¾ per cent. on the capital invested in it. Since the reorganization but $5,000,000 is a funded debt. The interest on this (7 per cent.) absorbed the whole of last year's profits and left nothing to the stock. The failure of the bridge to earn interest on its cost in one sense may be said to be due to its great cost; but this does not explain the matter satisfactorily to the investors, to whom the projectors of the bridge held out the expectation and reasonable certainty of a good return on the whole cost of the great structure. But the report for the last year does much to explain the difference between promise and fulfilment: the trouble is not so much a lack of traffic crossing at St. Louis, or even insufficient rates, but in the fact that a large portion of the actual transit traffic does not cross the bridge. Of the three roads from St. Louis to "Missouri River points," only one, the Wabash, St. Louis & Pacific, transfers its traffic by the St. Louis Bridge. The Missouri Pacific transfers every thing by the Carondelet ferry, and the Chicago & Alton by its own bridge at Louisiana. Moreover, the connection with the St. Louis, Iron Mountain & Southern is so circuitous and expensive that the bridge gets little of the through traffic that might be interchanged with that important line. The Missouri Pacific forms the St. Louis terminus of the St. Louis & San Francisco, and now of the Missouri, Kansas and Texas. Thus, of the whole railroad system west of the Mississippi, the bridge is sure of the transit traffic of the lines of but a single company. If it had what its projectors counted upon, that is, substantially all the traffic crossing the river from the east to St. Louis and from the west to East St. Louis, its profits, doubtless, would be more nearly in proportion to its cost. It is not likely that it will ever get the Chicago & Alton's business from Missouri River points, but it ought to be able to secure its and other roads' traffic interchanged with the Iron Mountain road, and we do not know why the Missouri Pacific should not find its advantage in using it, instead of the Carondelet ferry.

CAR-LOAD RATES, in the sense of a fixed rate per car without reference to the weight of the freight put into it, have become substantially a thing of the past, and "barrel," "ton," etc., rates seem to be disappearing. Until recently the Southwestern Association quoted rates only by "car-loads" on their lettered classes and on lumber and live-stock. Its west-bound tariff of July 1 gives no car-load rates, though as before the rates quoted for the lettered classes for lumber, salt, coal oil, coke, etc., are given only for minimum car-loads. Everything is quoted per 100 lbs. except salt, cement and plaster and coal oil, for which rates are given per barrel, and pig iron and rails, for which the rate is per ton of 2,240 lbs., by which these materials are almost universally bought and sold. At Chicago a very complete system for weighing cars loaded with lumber and some other staples is now maintained for nearly all the roads to the west, with results that have abundantly proved its advantage. Car-loads weighing 32,000 to 37,000 lbs. have not been uncommon, which under the old system were charged the same (for lumber) as those weighing but 20,000 lbs. The latter load, however, is now almost unknown even as a minimum; the average, we understand, is more than 25,000 lbs.

THE CENTRAL PACIFIC RAILROAD, which, in spite of the addition of the growing mileage of the Southern Pacific (which it works), has had little or no increase in gross earnings since 1875, this year shows a very satisfactory recovery, with comparatively little increase of mileage. For the half-year ending with June, the increase is 8 per cent. In 1879, the earnings were less than in 1878, and very little more than in 1876, though 70 per cent. more road was worked than in the latter year. The circumstances in California have been peculiar, and as that part of the country was comparatively prosperous while the rest of the land was suffering from great business depresssion, so there has been no such recovery there within the past two years as there has been here; and railroad business has suffered from the restrictions of the new constitution in addition. Under these circumstances, the gain of the past half-year is peculiarly encouraging—more so than the greater gains of some more favorably situated railroads.

NEW YORK GRAIN RECEIPTS have been stimulated by the Erie Canal to an extent that will best appear from the statement that in the 18 weeks ending with April its receipts were 25,268,000 bushels, but in the *nine* weeks ending with June they were no less than 32,788,000, or a quarter more in half the time. Meanwhile, the receipts of the other six Atlantic ports, which had been 44,027,000 bushels in the first 18 weeks of the half year, were but 29,876,000 in the last nine weeks. That is, 56.4 per cent. of New York's total receipts for the half-year have been since the canal began to deliver grain, and but 40 per cent. of the other ports' receipts. The maintenance of through rates by rail has given the canal an extraordinary amount of traffic, and all this has been of advantage to New York. Last year, in May and June, 38 per cent. of the whole Atlantic receipts were at Philadelphia and Baltimore; this year but 30 per cent.

JUNE EARNINGS have already been reported for a large number of roads, all showing an increase in comparison with last year, and in the aggregate as large an increase probably as in any other month of this year of great increases. Among those whose reports are given this week may be specified the Central Pacific, which has been long in showing any improvement, with an increase of 21.4 per cent., the New York Central & Hudson River, which has gained 31.5 per cent., the Chesapeake & Ohio (42.6), the Flint & Pere Marquette (64), the Lake Erie & Western (which, however, compares witht two pieces of road last year and still has very light earnings (133), and the main line of the St. Louis, Alton & Terre Haute (53.2).

WATER RATES are generally lower, and lake rates especially so, the latter closing Wednesday last at 4 to 4½ cents a bushel for corn and half a cent more for wheat from Chicago to Buffalo—nearly the lowest rates of the season, but not half as low as those that prevailed for several weeks last year, and in 1878 and 1877 also.

Canal rates have fallen about a cent a bushel, to 5 and 5¼ cents a bushel for corn from Buffalo to New York, and 5½ to 6 for wheat.

In ocean rates there has been less change; they have been a little lower, but have recovered to 6d. per bushel for grain (60 lbs.) by steam from New York to Liverpool.

Contributions.

Narrow Gauging the New York, Pennsylvania & Ohio Railroad.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Having been requested to write an account of the narrow-gauging of the New York, Pennsylvania & Ohio Railroad for your valuable paper, I will here endeavor to bring some few of the most notable points before your readers.

I know of no undertaking in which a railroad company can engage requiring more varied and extensive preparation than that of narrow-gauging, and in which the results would be so fatal should there be any wrong moves made or any item neglected.

This road (formerly the Atlantic & Great Western) was built with the 6-foot gauge commonly known as the broad gauge. The management of the road took very active steps to narrow-gauge in 1872, under the guidance of Mr. R. E. O'Brien, then Chief Engineer, who made efficient preparations on scientific bases, but unfortunately the work could not then be carried out on account of the unsettled financial condition of the road

We are greatly indebted to Mr. Lovett, of the Ohio & Mississippi Railroad, for the benefit derived from his successful narrow-gauging. In fact, he is entitled to the name of "the pioneer narrow-gauger."

As you noticed in your last issue, the change from 6 ft. to standard gauge was successfully made on Tuesday, June 22.

This standard of 4 ft. 8½ in. is the standard of American and English railroads, and I hope to see some of the leading roads of this country, that have now the compromise gauge (4 ft. 9 in.) narrow to the standard, that it may be universal in this country.

All railroad men are cognizant of the advantage of having all roads the same gauge. Trackmen well know the difficulty and danger attendant upon having wheels of different gauges go over the same frogs and switches—a great many broken wheels are caused in this way, and the wear and tear of frogs is increased materially. It is very difficult to keep frogs in line, over which compromise wheels run.

In narrow-gauging a road success depends principally on the preparations made. I will state briefly the preparations made on this road.

The Chief Engineer called a meeting of all the road-masters, and they discussed all the different points relating to track—each freely expressing his views. By this method we believed we arrived at a very good plan for handling material and organizing forces

We decided to move both rails inward 7¾ in., thereby obtaining the requisite change.

The following preparations were perfected previous to the day of change:

1st. All ties were adzed to a template.

2d. Five to seven inside spikes were driven to each rail, these inside spikes determining the new gauge.

3d. The lead and main track rails of frogs were cut, splices put on and bolted, and all connections cut at railroad crossing frogs.

4th. Telescope rods were put in switches, so that the switch rails could be moved without disconnecting the rods.

5th. Short rails were inserted on the outside of curves, giving sufficient expansion space to allow the outside rail to move in.

6th. Stringers were placed in cattle guards, and bridges prepared.

7th. All spikes were drawn from the inside flange of the broad-gauge rail, allowing only 3 or 4 spikes to a rail, and these were started.

8th. Highway crossings were adjusted so that planks could be rapidly removed and put in position for narrow-gauge rails.

It is very gratifying to be able to state that all these arrangements were carried out with the utmost precision, the evidence being that there was not one rail cut on the day of change, or a wheel off the main track along the entire distance narrow-gauged.

Besides the preparations made in the Engineering Department, there were extensive arrangements planned and executed in the Transportation Department with equal success. Every broad-gauge engine and car had to be moved from the narrow-gauge arena at 4 a. m. on Tuesday, June 22, and the new narrow-gauge rolling stock placed in position, so that business could be commenced in regular routine from each end of the several divisions when narrow-gauging was completed.

To accomplish this successfully some very close figuring was necessary. Train 3, the Western express (the last broad gauge train) reached its terminus only one minute before 4 a. m. Had it been within only a quarter of a mile of its destination at that time, it should stop, as the trackmen would have the rails torn up ahead of it. Several engines cleared only by five or ten minutes.

The entire distance narrow-gauged was 222 miles of main track and 45 miles of side tracks; this is between Leavittsburg, Ohio, and Dayton, Ohio. The work of narrow-gauging commenced at 4 a. m., and all the main track was completed about 9 a. m. Passenger train No. 7 left Leavittsburg on time at 9:05 a. m., so the line was closed only five hours.

There were about 2,500 trackmen employed on the day of change. They were distributed in the following manner: Two gangs of 22 men each, with one or two water boys, started from each end of five-mile sections and worked toward the centre: this was allowing 44 men to each section. In yards this force was increased.

Each gang of 22 men was worked as follows:

Four men pulling spikes—two each side.

One sub-foreman with maul to drive stubs.

Six men lining—three on a side.

Ten spikers—five on a side.

One foreman.

Such a gang, composed of good men, well organized, can narrow-gauge one mile of track in one hour and fifteen minutes; some gangs state that they completed 2½ miles in 2½ hours.

I never saw men engage in work with such energetic spirit and good will; each one doing his utmost. It was a race in which every gang represented a team, among the members of which no jealousy existed. When one man found that the man following could outwork him, he yielded his place with a free and graceful will.

We all feel proud that our work has been so highly appreciated by the Chief Engineer and President, as is shown by the following circular:

"CLEVELAND, O., June 24, 1880."

"*To the Employés of the Engineering Department.*

"It is a source of great gratification to me that I am able to congratulate you all upon the successful completion of the narrow-gauging of the main line of the New York, Pennsylvania & Ohio Railroad; and in the name of the management of the company as well as in my own, I heartily thank each and every employé of this department for the very efficient and faithful co-operation which has brought our work to a satisfactory and successful completion.

"I recognize in this last effort the same faithful attention to duty which has characterized you heretofore. It has not passed unnoticed, and has enabled me to feel and know that the work would be well done.

"In this connection I call your attention to the following dispatch from the President of the road.

"CHARLES LATIMER,
"Chief Engineer."

"CLEVELAND, June 22, 1880.

"CHARLES LATIMER:

"Your several dispatches received. I congratulate you upon the complete success of your important work and thank yourself and officers and men, one and all, for their faithfulness and energy. "J. H. DEVEREUX."

We borrowed about 1,000 men from adjoining roads, and they entered into the spirit of the undertaking with as much energy as our own men; to these a great deal of credit is due.

It was argued at first, that if only one rail was moved it would save considerable labor. It might at first, but we concluded that the advantages gained by moving both rails more than counterbalanced the extra labor, as there is a better and more uniform bearing obtained for the rails, the centre line is preserved (a great advantage in bridges, side-tracks, and at platforms), and extra life obtained in ties by getting a fresh part of the tie for both rails. The latter point I consider adds two years to the life of every tie, or about 10 per cent. to each tie, which would give a total credit of about seventy thousand dollars.

When riding on passenger trains the day after narrow-gauging, I heard it remarked by several that the cars ran smoother than before, an opinion in which I concur.

A ROADMASTER, N. Y., P. & O. R. R.

YOUNGSTOWN, Ohio, June 29, 1880.

The Ethics of Railroad Expenditures.*

Leaving out of consideration the disbursements for labor on account of the construction work that progresses uninterruptedly with more or less activity upon every railway line, we find that the average outlay of a company for labor is in the neighborhood of 60 per cent. of the gross cost of operating, and about 38 per cent. of the aggregate revenue. In other words 38 per cent. of the total amount collected from the community for transportation services is at once returned to it in the shape of wages paid to railway operatives; of the remainder, 26 per cent. is disbursed for taxes and supplies, a portion is paid out for interest, and the balance is available for dividends, save such portion as may be required to meet the necessary additions and improvements required by the property. These additions and improvements, it may be said, however, are sufficient, in many instances, to absorb any income there may be left after meeting operating expenses, taxes and the interests on the funded debt, leaving nothing whatever to the proprietor or shareholder. In other cases only a portion of the surplus is expended upon the property. However, whatever proportion is thus diverted it clearly belongs to the owner, and upon it he is entitled to interest as in the case of the original investment. The only right and proper way, therefore, to treat expenditures of this kind is to capitalize them. This capitalization may occur at any time subsequent to the outlay, whenever, in fact, the credit of the company interested will allow, or the interest of the property will permit. Only by such a course is it possible for the lender, who in this case is the shareholder, to be sure of a return upon his investment.

The fact that the principal disbursements of a railway company in connection with its current operations are for labor is not generally known even to railway men.

*From advance sheets of Marshall M. Kirkman's forthcoming work (in two volumes) entitled "Railway Expenditures; their Extent, Object, and Economy," from the press of the *Railway Age* Publishing Company.

This is one of the minor surprises that attend a minute investigation of the subject. Other things equally remarkable, but of relatively greater importance, perhaps, to the community, will occur to us if we seek to develop the subject. We shall find, for instance, if we carefully examine the working of our railway system, that the law of political economy, the law of supply and demand, as explained by those who have studied the subject, apply to our railway companies with surprising accuracy; that the same influences, in fact, that operate in fixing the status and value of manufactured products apply equally to transportation—the manufactured product of railroads; that railroad property is the first to feel any disturbance in the economy of life, whether it be in the value of real estate, the price of breadstuffs, the rate of wages, or the price put upon manufactured and other materials. It will also appear that any thing that acts to the disadvantage of the railroad interest, whether produced by natural or artificial laws, will ultimately produce a corresponding depression in the community at large. Notwithstanding this fact, it has long been apparent to intelligent observers that a very large class of our people look upon the railroad interest as something apart from the common industrial affairs of the community, and not a matter about which those interested in the latter need give themselves any concern. Nothing, however, could be more fallacious than such a view of the question, or more pernicious in its consequences to the general public.

The interests of the people, as a whole, are indissoluble, and anything that operates to the detriment of one class, be it the owners of railways or the owners of farming lands, will eventually prove correspondingly injurious to all other classes. The source from which the injury emanates is immaterial. In the case of railroads it does not matter whether it arises from unwise legislation, the pressure of public opinion, unjust criticism, excessive competition between rival lines, or from unfit or extravagant management. The effect, direct and collateral, is substantially the same in either case, so far as it regards ultimately the material prosperity of the community at large.

A more just appreciation of these facts and a higher observance of their requirements, it is apparent from a retrospective view of the past history of railroads in the United States, would have added greatly to the prosperity of both the railroad companies and the public.

The collection of the revenue of a railroad company and its disbursement may be said to be coincident. Frequently, however, the revenue is anticipated, being expended or contracted for in advance of its occurrence. Under the most favorable circumstances the uncollected earnings of our railway companies equal, if they do not exceed, their current obligations. The receipts from merchants and others for transportation services do not, consequently, remain in the vaults of the railroad company, but pass back without sensible interlude into the possession of the persons from whom they were received. The proceeds of the check given by the grocer or hardware merchant for the carriage of his goods he receives back directly with its accretions through the medium of purchases made by the railway company or its servants, or, indirectly, through the trade of those who are dependent for their subsistence upon the interests that centre in the property of railroad companies.

The remunerative revenue that is derived from the movement of grain and other products of the farm is largely disbursed, as we have already explained, for improving the property, and in adding to its capacities, thereby enabling the proprietors to accommodate the agricultural classes with greater expedition and at lower rates than would otherwise be possible.

The history of our railway companies abundantly demonstrates this.

Thus the railway companies and the different classes of society are blended in a common purpose, a purpose having for its object the advancement of the interests of each other, and in the accomplishment of this great and beneficent purpose each element contributes, though selfishly, perhaps, what it is able to the betterment of the other.

It is apparent that no interest so considerable as that of the railway companies can be stricken down without a corresponding depression being felt in every field of industry. The prosperity of the laborer, merchant, landowner, farmer, or newspaper proprietor is only of temporary duration if the interests centering in our transportation companies are unremunerative.

Mr. William H. Vanderbilt (who has, without doubt, as great a personal interest in the continued prosperity of the country as any other citizen of the Union), having occasion to refer, incidentally, to this phase of the subject in a communication to the *Chicago Times* in June, 1878, says, with great pertinency, "Every bankrupt line tends to drag others down; such a road pays nothing to stockholders or bondholders; it has no responsibility to owners, patrons or the public. * * * If all the great trunk lines were brought to that condition, not only would immense properties be destroyed but credit and trade be so paralyzed that every interest and the whole country would be irreparably injured." What Mr. Vanderbilt says of the great trunk lines applies with equal force to the railroad interest generally, or to particular portions of it, without reference to location.

The exactions of capital, wherever placed, are fixed and determinate and in happy accord. Without its confidence and support industries languish and die. Enterprises widely separated, or seemingly having no connection whatever, wait patiently upon each other's prosperity. An attack upon one recoils directly upon the other. We see that everywhere the bond of sympathy is complete, and that the equilibrium of trade is as essential to the fruition of generous enterprises in business as the equal and exact distribution of the forces of nature are necessary to their harmonious action. Anything, therefore, that jeopardizes the credit of our railroad companies, or restricts them in the exercise of the privileges necessary to their successful operation, is unwise, and will eventually re-act upon the public that countenances or encourages such practices.

It is also apparent that the interests centering in our railways cannot, with safety, be made subservient to the selfish purposes of others, as a large class of our people seems to suppose, nor can the methods by which the roads are operated be changed, no matter how specious the argument or ingenious the theory, without the introduction of forces that cannot but prove detrimental. Our observation is uniform in this, that when a community attempts to make any great interest, such as that centered in our railroads, subordinate to some personal or purely local purpose, such attempt is destructive to the prosperity of the people who precipitate it; and the disastrous results that follow their efforts are not measured, as we might hastily suppose, by the temporary success they meet with; on the contrary, their efforts may fail, as they often do, of accomplishing the object sought. Nevertheless, they have the effect to destroy or cripple the prosperity of the community through the distrust they engender everywhere in the minds of business men and capitalists, upon whom such industries are dependent.

Railway property, like all other classes of property, founded upon the wants of the community, must be left untram meled, otherwise it can not reach its maximum of usefulness. No substantial or permanent good to the people will ever be accomplished by the unsolicited interference of the government in its affairs, or through the introduction of extraneous influences in its daily operations. When its interests, and indirectly the interests of the community, can be benefited by the active interference of the government in its affairs, we may confidently believe that those who own our railroads will eagerly invoke such interference. Until that time arrives active interference is inopportune.

Like every other business enterprise that by its beneficent influence merits our esteem, the control and direction of our railroads must be left to those general laws that govern the commerce of the community in which they are placed, if we wish to reap the greatest good of which they are capable. The forces that operate in the formation and control of these influences are based on the general intelligence of mankind, and may be termed God's natural laws. All other laws are more or less restrictive in their operations, beside being transitory in their forces and accidental in their application.

The first element necessary to success in the affairs of trade is definiteness of knowledge as to the influences that are likely to operate to the advantage or disadvantage of the project in hand, whatever it may be, and until such influences can be ascertained and weighed the enterprise will languish for want of support.

These pertinent and well established truths being apparent we may estimate the injury that has been done to all classes of people, though without their knowing the cause in all cases perhaps, in consequence of the ill-considered and unnecessary legislation (state and municipal) that our railway companies have suffered from; in consequence of the fostering of a belief in the public mind that railway property is more selfish in its exactions than other kinds of property, and that it is largely based upon fictitious (or watered) values; in consequence of the assertion, direct and implied, that the interests of the railway companies and those of society are inimical, and finally, and in consequence of a belief, participated in by a large class of people, that the railway interest can be made subservient to selfish purposes of a nature foreign to its natural intention without detriment to the community or state that attempts it.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Meetings.

Meetings will be held as follows:

Central Pacific, adjourned annual meeting, at the office in San Francisco, Aug. 10.

Dividends.

Dividends have been declared as follows:

Atchison, Topeka & Santa Fe, 2 per cent., quarterly, payable Aug. 15.

Louisville & Nashville, 5 per cent., semi-annual, payable Aug. 2. The February dividend was 3 per cent.; in the previous year 4 per cent. was paid for the year.

Middletown, Unionville & Water Gap (leased to New Jersey Midland), 3½ per cent., semi-annual, payable July 10.

Terre Haute & Indianapolis, 4 per cent., semi-annual, payable Aug. 2, at the company's office in Terre Haute, or at the Farmer's Loan & Trust Company's office, in New York.

Southern Railway and Steamship Association.

Notice is given that the annual convention of the Southern Railway & Steamship Association will be held at the Kimball House, Atlanta, Georgia, on Wednesday, August 11, 1880, as per articles of agreement.

All transportation companies, members of or working with the Association, are requested to send duly authorized representatives.

Directors and committees from stockholders of companies members of Association, are, under rules of Association, invited to attend.

The Convention will be called to order at 3½ o'clock p. m.

Atlantic & Great Western Mutual Insurance Company.

At the recent annual meeting in Warren, O., President John B. Shaw presented an annual address, stating the condition of the Association. The report of the Secretary showed a membership of 978; amount paid out during the year, $13,459.70.

An amendment to the constitution was adopted, changing the name of the Association to New York, Pennsylvania & Ohio Mutual Insurance Association, to conform with the change in the name of the road.

ELECTIONS AND APPOINTMENTS.

American Society of Civil Engineers.—The June *Transactions* announces the following additions to the list of members: Justin Dirks, of Amsterdam, Holland, and Max Maria Baron von Weber, of Berlin, elected June 2, to be Hnonary Members; David McN. Currie, of St. Louis; Morris M. Defrees, of Indianapolis; James McNaughton, of Albany; Alber H. Robinson (Chief Engineer of the Atchison, Topeka & Santa Fe Railroad), of Pueblo, Col.; Jose Giberga Tintorer, of Barcelona, Spain; Charles G. Weir, of New York City, and Samuel H. Yonge, of St. Charles, Mo., elected May 5; Wm. M. Huges, of Cincinnati; Charles Kellogg (of Kellogg & Maurice, bridge-builders), of Athens, Pa.; Henry Manley, of Boston, elected June 2; and Henry G. Morse (of the Morse Bridge Co.), of Youngstown, O., and Prof. Charles A. Smith, of Washinton University, St. Louis, elected April 7, to be members; Edward Baumann, Architect, of Chicago; Geo. W. C. Belcher (of the Belcher Sugar Refining Co.), of St. Louis, and Wm. H. Burr of the Troy Polytechnic Institute, elected as Associates; Benj. L. Crosby, Assistant Engineer of the Plattsmouth Bridge, elected Junior.

Baltimore & Ohio.—Mr. Charles B. Schenck has been appointed Assistant Auditor, in place of A. LaFayette, resigned. He has been with the company some time, but was formerly on the Chicago & Alton.

Mr. J. R. Gordon has been appointed General Manager of the company's hotels, succeeding Mr. W. F. Gale, who remains Manager of the Queen City Hotel.

Boston & Brookline.—The directors of this new company are: J. P. B. Carlton, Wm. R. Clark, George W. Coleman, George F. Hall, H. W. Wesson, James A. L. Whittier, Boston; Charles Jordan, George H. Towle, Wakefield, Mass.; Augustus Whittemore, Brookline, Mass.; Clerk, Frederick Nourse, Boston.

Boston & Dorchester.—The directors of this new company are: Charles Jordan, George H. Towle, Wakefield, Mass.; Augustus Whittemore, Brookline, Mass.; J. P. B. Carlton, Wm. R. Clark, George W. Coleman, George F. Hall, H. W. Wesson, James A. L. Whittier, Boston; Clerk, Frederick Nourse, Boston.

Cairo & Vincennes.—The directors of this new company organized by the bondholders are: W. P. Halliday, Roswell Miller, J. Pierpont Morgan, Anthony J. Thomas, Samuel P. Wheeler.

Cambridge & South Boston.—The directors of this new corporation are: Augustus Whittemore, Brookline, Mass; Charles Jordan, George H. Towle, Wakefield, Mass; J. P. B. Carlton, Wm. R. Clark, George W. Coleman, George F. Hall, H. W. Wesson; James A. L. Whittier, Boston; Clerk, Frederick Nourse, Boston.

Charleston & Milton.—The officers of this new company are: J. P. B. Carlton, Wm. R. Clark, George W. Coleman, George F. Hall, H. W. Wesson, James A. L. Whittier, Boston; Augustus Whittemore, Brookline, Mass.; Charles Jordan, George H. Towle, Wakefield, Mass.; Clerk, Frederick Nourse, Boston.

Chesapeake & Ohio.—Mr. E. F. Kelly has been appointed Assistant General Freight Agent, with office in Richmond, Va.

Mr. N. M. Johnston has been appointed General Western Agent, with office in Cincinnati.

Cincinnati & Eastern.—This company has re-elected the following officers: President, W. R. McGill, Newtown, O.; Secretary and Auditor, Wm. Mansfield; Treasurer, M. Jamison. The directors are: W. R. McGill, S. Woodward, J. P. Duckwall, J. P. Neely, James Hulick, C. Thomas, O. H. Hardin, F. M. Smith, J. M. Crisman, N. Thompson, Stephen Reynolds, Henry Phillips.

Fonda, Johnstown & Gloversville.—At the annual meeting in Gloversville, N. Y., July 13, the following directors were chosen: W. J. Heacock, D. A. Wells, J. McNab, L. Caten, L. Vighte, A. Judson, D. B. Judson, J. E. Wells, M. Wade, H. H. Pettit, N. Littauer, A. D. L. Baker, G. F. Mills. The board re-elected W. J. Heacock, President; D. A. Wells, Vice-President; L. Caten, Secretary and Superintendent; J. McNab, Treasurer.

Genesee Valley.—This company has been organized with the following officers: President, C. J. Whitney, Bradford, Pa.; Vice-President, G. E. Fisher, Rochester, N. Y.; Secretary, A. N. Cole, Wellsville, N. Y.

Hudson Tunnel Railroad.—The New York company of this name has elected S. L. M. Barlow, President; L. C. Fowler, Secretary; Charles G. Lincoln, Treasurer.

Intercolonial.—Mr. Frank Shanly has been appointed Chief Engineer.

Lake Shore & Michigan Southern.—The following circular has been issued by General Passenger Agent W. P. Johnson: : Mr. W. A. Cromwell is appointed New York and New England Passenger Agent, with headquarters at No. 252 Broadway, New York, and No. 210 Washington street (Old State House), Boston. His district will embrace the cities of New York, Brooklyn and Jersey City, and thence north on both banks of the Hudson River, and including Albany, Troy and Saratoga Springs, to Whitehall, N. Y.; thence north on the east bank of Lake Champlain to the Canada line, and all east of there, including New England and the Provinces.

"Mr. J. A. Burch is appointed Eastern and Southern Passenger Agent, with headquarters at Buffalo. His district will embrace the territory west and north of Whitehall, N. Y., including the west bank of Lake Champlain and the east bank of the St. Lawrence River to the Canada line (including the Ogdensburg district and province of Ontario); thence west, including the New York Central, *via* Buffalo and Niagara Falls, also the line of the New York, Lake Erie & Western Railway and connections west of New York city, the North Pennsylvania, Lehigh Valley, Philadelphia & Reading, and all lines north and west of and including Philadelphia; and from Buffalo west and south, including Cleveland, to Indianapolis and Louisville, and the lines of the Louisville & Nashville and Cincinnati Southern railways to Chattanooga, and all east of there and south of the Lake Shore & Michigan Southern Railway to Pittsburgh, Philadelphia, Baltimore and Washington."

Lockport & Buffalo.—At the annual meeting in Lockport, N. Y., July 12, the following directors were chosen: Thomas T. Flagler, Benjamin H. Fletcher, Joseph A. Ward, James Jackson, Jr., John Hodge, Benjamin Carpenter, Lewis S. Payne, Elisha Moody, J. Carl Jackson, Levi F. Bowen, John H. Buck, James O. King, Isaac H. Babbock. The Board elected Thomas T. Flagler, President; B. H. Fletcher, Vice-President; J. H. Ward, Secretary; John Hodge, Treasurer. The road is leased to the New York, Lake Erie & Western.

Meadville.—This company was organized July 7, by the election of the following officers: President, James J. Shryock; Directors, A. C. Huidekoper, S. B. Dick, W. P. Porter, Cyrus Kitchen, A. S. Dickson, Walter Harper, G. Wallace Delamater, Meadville, Pa.; C. A. Stratton, Linesville, Pa. The board elected G. Wallace Delamater Treasurer.

Metropolitan Elevated.—At the annual meeting in New York, July 8, the following directors were chosen: Wm. R. Garrison, John Baird, Jose F. Navarro, Wm. Foster, Jr., George M. Pullman, Horace Porter, John P. Kennedy, Wm. Adams, Jr., George J. Forrest, Charles H. Clayton, Mortimer Ward. The only new director is Mr. Ward, who succeeds Fausto Mora, who has gone to Europe.

Midland, of New Jersey.—The office of President will remain vacant for the present, Vice-President Parsons acting as President for a time.

Mr. H. M. Britton is appointed General Manager and Superintendent. He was formerly on the Whitewater Valley and more lately on the New York & New England. He was, for several years, President of the Master Mechanics' Association—its first President.

Montgomery Southern.—The directors of this new company are: Thomas Joseph, W. H. Graves, Joseph Goetter, John H. Clisby, T. B. Wilkinson, J. W. Hardie, M. F. Rushton, M. L. Moses, W. F. Vandiver, W. L. Chambers, M. P. LeGrand. Offices at Montgomery, Ala.

New Jersey.—Mr. F. J. McWade has been appointed Assistant General Ticket Agent. He has been for some years in the Passenger Department of the Pennsylvania Railroad.

North Carolina.—The Governor of North Carolina has appointed the following state directors in the North Carolina Railroad Company: R. F. Hoke, of Wake; W. T. Kornegay, of Wayne; Donald McRae, of New Hanover; Pride Jones, of Orange; John L. Morehead and Armistead Burwell, of Mecklenburg; Kerr Craige, of Rowan; J. I. Scales, of Guilford.

At the annual meeting in Greensboro, N. C., July 8, the following directors were chosen by the stockholders: F. H. Fries, Dr. R. B. Haywood, M. L. Holmes, T. M. Holt. The board re-elected Col. T. M. Holt President; P. B. Ruffin, Secretary and Treasurer. The road is leased to the Richmond & Danville Company.

Northern Pacific.—Mr. C. T. Hobart has been appointed Engineer in charge of local improvements on this road.

Old Colony Railroad Mutual Relief Association.—This

Association last week elected the following officers: President, D. F. Desmond; Vice-President, T. F. Mulcahey; Secretary, R. E. Darrah; Financial Secretary, W. D. Snow; Teasurer, H. W. Felch.

Peoria & Jacksonville.—The directors of this company successor to the Peoria, Pekin & Jacksonville) are: Thomas Crotty, Lawrence W. James, George Skinner, Peoria, Ill., Solon Humphreys, Morris K. Jesup, New York.

Portsmouth, Great Falls & Conway.—At the annual meeting in Portsmouth, N. H., July 13, the following directors were chosen: John Cumnock, George E. B. Jackson, S. C. Lawrence, E. B. Phillips, Willard P. Phillips. The road is leased to the Eastern Company.

Oregon Central.—The board has elected F. G. Cornelius President; J. N. Dolph, Vice-President; A. G. Cunningham, Secretary and Treasurer.

PERSONAL.

—Mr. A. LaFayette, Assistant Auditor of the Baltimore & Ohio, has resigned on account of ill health.

—Mr. W. E. Lewis has resigned his position as Superintendent of the Midland Railroad of New Jersey.

—Mr. Alfred White has resigned his position as Assistant to the General Manager of the Detroit, Grand Haven & Milwaukee Company.

—Hon. G. A. Hobart has tendered his resignation as President of the Midland Railroad Company, of New Jersey. The board refused to accept his resignation, but he would not withdraw it.

—Mr. Joseph Miller Wilson, of Philadelphia, has been awarded by the Council of the (British) Institute of Civil Engineers a Telford premium for his "Description of a Bridge over the Monongahela River, at Port Perry, Pa."

—Mr. W. H. K. Bibby died at Paterson, N. J., July 9, aged 77 years. He had been for 55 years Secretary of the Phœnix Manufacturing Company of that city, and was for nearly 25 years Secretary of the Paterson & Hudson River Railroad Company.

—Mr. Sanford Fleming, who has recently retired from the office of Chief Engineer of the Canadian Pacific Railway, was offered by the government the position of Chief Engineer of the Intercolonial and Consulting Engineer of the Pacific road. He has, however, refused the new office.

—Mr. David M. Lord, who died in New York, July 14, aged 88 years, was one of the first directors and most active workers for the New York & Erie Railroad. He was formerly a wealthy New York merchant, but had lived a retired life for many years, having lost nearly all his money.

—Mr. Simon P. Kase, President and a director for seven years of the Danville, Hazleton & Wilkesbarre road, has been sued to recover money for which, it is claimed, he is responsible. The charges are that he sold many of the bonds and did not account for the proceeds, and that he sold certain unnecessary real estate and has not given up the money fully, or accounted for the same.

TRAFFIC AND EARNINGS.

Bonding for "Immediate Transportation."

Under the act of June 10, 1880, "to amend the statutes in relation to the immediate transportation of dutiable goods, and for other purposes," the following-named railroads and other common carriers have bonded:

The Baltimore & Ohio Railroad, by William Keyser, Second Vice-President, in the sum of $250,000, from the port of Baltimore to the following-named ports: New York, Philadelphia, Pittsburg, Chicago, St. Paul, Cleveland, Milwaukee, Memphis, New Orleans, St. Louis, Cincinnati, Toledo, Louisville, San Francisco.

Also a second bond in the same amount, for transportation from the port of Philadelphia to the ports above named.

A third bond in the sum of $500,000 for transportation from the port of New York to the ports above named.

The routes over which the above ports are reached are over the Pennsylvania Railroad, Philadelphia, Wheeling & Baltimore, Baltimore & Ohio, Marietta & Cincinnati, Ohio & Mississippi, Louisville & Nashville, South & North Alabama, Mobile & Montgomery, New Orleans & Mobile, Chicago, Milwaukee & St. Paul, Chicago & Northwestern, Pittsburgh & Lake Erie, New York, Pennsylvania & Ohio, Lake Shore & Michigan Southern, Chicago, Rock Island & Pacific, Chicago, Burlington & Quincy, Union Pacific, Central Pacific, Missouri Pacific, Wabash, St. Louis & Pacific, Chicago & Alton, Kansas Pacific, Kansas City, St. Joe & Council Bluffs, and such other railroads as may hereafter be specially authorized and designated by the Secretary of the Treasury.

The Pennsylvania Railroad Company, by George B. Roberts, President, has bonded in the sum of $250,000 for transportation from the port of Philadelphia to the ports of Boston, New York, Pittsburgh, Baltimore, Toledo, Cleveland, Cincinnati, Chicago, Milwaukee, St. Paul, St. Louis, Louisville, Memphis, New Orleans, San Francisco, or to any other ports now named in the seventh section of the Act of June 10, or that may be named in any act hereafter passed in relation thereto over the following-named line of railroads: New York & New England, New Jersey, Pennsylvania, Northern Central, Cleveland & Pittsburgh, Pittsburgh, Fort Wayne & Chicago, Northwestern, Pittsburgh, Cincinnati & St. Louis, Chicago, Milwaukee & St. Paul, Terre Haute & Indianapolis, St. Louis, Vandalia & Terre Haute, effersonville, Madison & Indianapolis, Louisville & Nashville, Terre Haute, Chicago, Burlington & Quincy, Union Pacific, Central Pacific, and such other railroads as may be hereafter specially authorized and designated by the Secretary of the Treasury.

Also, a further bond, in the sum of $500,000, for transportation from the port of New York to the above-mentioned ports by the routes described.

The Merchants' Dispatch Transportation Company, by James C. Fargo, President, has bonded, in the sum of $500,000 from the port of New York to the ports of Boston, Philadelphia, Pittsburgh, Baltimore, Richmond, Portland (Me.), Chicago, Detroit, St. Louis, St. Paul, Cincinnati, Cleveland, Toledo, Milwaukee, Louisville, Memphis, Mobile, and San Francisco, and such other ports as may be hereafter designated as ports to which such merchandise may be transported during the continuance of this bond. The railroads designated embrace all those connecting with the ports named.

The same company has also made application, and the same has been approved, to bond from Boston to the ports above named.

The New York, Lake Erie & Western Railroad, by Thomas Dickson, acting President, has bonded in the sum of $500,000 from New York to the ports of Buffalo, Burlington, Vt., Boston, Providence, New Haven, Hartford, Middletown, Philadelphia, Pittsburgh, Baltimore, Wilmington, Georgetown, Norfolk, Richmond, Wilmington, N. C., Charleston, S. C., Savannah, New Orleans, Portland, Bath, Portsmouth, N. H., St. Louis, St. Paul, Cincinnati, Cleveland, Toledo, Chicago, Detroit, Port Huron, Milwaukee, Louisville, Memphis, Mobile, Galveston, San Francisco, San Diego, Portland, Or.

The Boston & Providence Railroad, by Henry H. Whitney, in the sum of $250,000, from the port of Boston to the port of Providence, R. I.

Various other railroads and transportation companies have made application to bond, but their applications have not been finally acted upon.

Railroad Earnings.

Earnings for various periods are reported as follows:

	1880.	1879.	Inc. or Dec.	P. c.
Six months ending June 30:				
Atchison, Topeka & S. F.	$3,704,353	$2,753,017	I. $951,336	34.6
Central Pacific	8,484,255	7,855,408	I. 628,847	8.0
Chi. & Alton	3,401,889	2,183,913	I. 1,217,976	55.8
Chicago, Bur. & Quincy	7,973,777	6,510,238	I. 1,463,539	22.5
Net earnings	3,875,694	2,880,872	I. 994,822	34.5
Chi. & Northwestern	8,390,313	6,960,332	I. 1,429,981	20.5
Chicago, St. L. & Minn.	693,547	550,742	I. 142,805	25.9
Chesapeake & Ohio	1,256,425	812,808	I. 443,617	54.6
Del. & Hud., leased lines	2,308,236	1,778,699	I. 529,537	29.2
Flint & Pere Marquette	743,117	518,201	I. 224,906	143.4
Grand Trunk	4,958,522	4,168,131	I. 790,391	18.9
Ill. Central, Ill. lines	2,800,194	2,528,460	I. 271,734	10.7
Ill. Central, Iowa lines	754,100	699,442	I. 54,658	7.8
Ind., Bloom. & Western	569,704	523,150	I. 46,554	8.9
Int. & Gt. Northern	709,936	684,293	I. 25,643	3.8
Mobile & Ohio	1,003,158	856,579	I. 146,579	17.1
Nash., Chatta. & St. L.	1,034,550	847,840	I. 186,710	22.0
N. Y. Cent. & Hud. River	15,742,478	13,157,968	I. 2,584,510	19.6
Northern Pacific	910,031	709,242	I. 200,789	28.3
Og. & L. Champ.	214,917	148,975	I. 65,942	44.3
St. L., Alton & T. H., Main Line	620,083	400,247	I. 219,833	54.9
St. L., A. & T. H., Belleville Line	297,860	247,766	I. 50,094	20.2
Scioto Valley	134,744	124,079	I. 10,665	8.6
Toledo, Peo. & War	660,636	574,266	I. 86,370	15.0
Month of June:				
Atchison, Top. & S. F.	$720,000	$410,000	I. $310,000	75.6
Central Pacific	1,752,000	1,443,088	I. 308,912	21.4
Chesapeake & Ohio	211,645	148,457	I. 63,188	42.6
Chi. & Alton	609,255	447,794	I. 161,461	36.1
Chi., Bur. & Quin.	1,259,528	1,160,967	I. 98,561	8.5
Chi. & Northwestern	1,653,000	1,393,087	I. 259,913	18.4
Chi., St. Paul & Minn.	115,253	96,993	I. 18,260	18.8
Del. & Hud. lines	311,238	232,936	I. 78,302	33.6
Flint & Pere Marquette	121,376	73,996	I. 47,380	64.0
Ill. Cent., Ill. lines	521,277	460,171	I. 61,106	13.3
" " Iowa lines	122,230	120,407	I. 1,823	1.5
Ind., Bloom. & Western	106,954	90,821	I. 16,133	17.7
Int. & Gt. North'n	97,418	86,648	I. 10,770	12.4
Lake Erie & Western	112,565	48,278	I. 64,287	133.1
Mobile & Ohio	113,570	91,609	I. 21,861	24.0
Nash., Chatta. & St. L.	154,000	115,000	I. 39,000	33.9
St. Paul, Minn. & Manitoba	243,407	190,349	I. 53,058	27.9
N. Y. Central & Hud. River	2,653,477	2,622,823	I. 630,654	31.2
Northern Pacific	261,269	198,744	I. 62,525	31.5
Og. & Lake Champ.	48,784	35,870	I. 12,914	36.0
St. L., A. & T. H., Main Line	105,988	69,169	I. 36,819	53.2
St. L., A. & T. H., Belleville Line	41,980	31,736	I. 10,244	32.2
Scioto Valley	21,875	17,661	I. 4,214	23.8
Toledo, Peoria & War	121,814	89,224	I. 32.590	36.5
First Week in July:				
Chi. & Eastern Ill.	$25,813	$15,315	I. 10,498	68.6
Denver & Rio Gr.	71,543	23,137	I. 48,406	210 0
Mo., Kan. & Tex.	64,277	49,509	I. 14,768	30.8
St. Louis, Iron Mt. & So.	102,000	71,921	I. 30,079	41.8
Five months ending May 31:				
At., Miss. & Ohio.	$768,750	$613,239	I. $155,511	25.4
Net earnings	404,612	241,126	I. 163,486	67.8
Bur., Cedar Rap. & Northern	828,968	543,645	I. 285,323	52.5
Net earnings	299,622	184,160	I. 115,462	61.1
Carolina Central	191,731	179,645	I. 12,086	6.7
Net earnings	66,145	66,154	D. 9	....
Chesapeake & Oh.	1,044,780	664,351	I. 380,429	57.4
Net earnings	217,715	68,057	I. 149,658	219.7
Louisville & Nashville	3,053,586	2,124,526	I. 929,040	43.7
Net earnings	1,200,444	705,121	I. 495,323	50.9
N. Y. Lake Erie & Western	7,429,252	6,434,372	I. 994,880	15.5
Net earnings	2,735,764	1,564,318	I. 1,171,446	74.9
St. L., Iron Mt. & Southern	2,255,032	1,647,173	I. 607,859	36.9
Net earnings	702,040	436,581	I. 265,459	62.2
Four months ending April 30:				
Atl. & Charlotte Air Line	$300,113	$250,310	I. $49,803	19.9
Chi. & Alton	2,190,501	1,314,181	I. 876,320	66.7
Net earnings	884,487	521,196	I. 363,291	69.7
Month of April:				
Atl. & Charlotte Air Line	$52,916	$52,816	I. $100	0.2
Net earnings	13,596	13,570	I. 26	0.2
Month of May:				
Carolina Central	$23,511	$23,587	D. $76	0.3
N. Y. & New England	183,700	166,283	I. 17,417	10.5
Net earnings	37,254	.....	.....	....
N. Y., Lake Erie & Western	1,592,544	1,350,574	I. 241,970	17.9
Net earnings	620,109	285,787	I. 334,322	117.0
Week ending July 3:				
Grand Trunk	$197,218	$152,910	I. $44,308	29.0

Grain Movement.

For the week ending July 3 receipts and shipments of grain of all kinds at the eight reporting Northwestern markets and receipts at the seven Atlantic ports have been, in bushels, for the past seven years:

	Northwestern	—Northwestern Shipments.—		P. c.	Atlantic
Year.	Receipts.	Total.	By rail.	by rail.	Receipts.
1874	3,825,508	3,380,618	1,420,103	42.0	4,351,626
1875	2,257,303	2,939,833	786,919	26.7	2,805,086
1876	2,737,617	2,970,194	1,205,184	40.6	3,824,336
1877	1,939,151	2,416,415	557,394	23.1	2,060,484
1878	3,006,566	3,059,500	826,301	27.0	3,662,715
1879	3,779,676	3,829,431	1,236,651	32.3	3,457,237
1880	5,117,800	6,025,682	1,709,241	28.4	8,192,047

The receipts of Northwestern markets, though very much larger than in any corresponding week of previous years, are the smallest since the middle of May. In haying and harvest they are usually light, but when there is a large and early winter wheat crop, as this year, they may be expected to become large again before the end of July. The shipments of these markets are also very much larger than in any corresponding week of previous years, and last year there were but two weeks before harvest when they were exceeded, but this year they are the smallest shipments for six weeks. The quantity shipped by rail has been exceeded this year but four times since navigation opened. The receipts at Atlantic ports have been exceeded but twice this year, and were never equaled before harvest in any previous year.

Of the Northwestern receipts Chicago had 53.3 per cent., St. Louis 20.8, Toledo 8.2, Peoria 6.6, Milwaukee 4.2, Cleveland 2.6, Detroit 2.5, and Duluth 1.8 per cent. About one-fifth of the shipments were wheat, and nearly one-half of the wheat was from St. Louis, but nearly two-thirds of the corn was from Chicago and only one-eighth from St. Louis.

Of the receipts at Atlantic ports New York had 52.2 per cent., Philadelphia 15.9, Baltimore 14.9, Boston 9.4, Montreal 5.1, New Orleans 2.4, and Portland 0.1 per cent. New York's receipts until canal arrivals begun this year had been 36½ per cent. of the whole; since that time they have been more than 50 per cent.

Exports for the first week of July were much smaller than in either of the two weeks preceding.

Executing the Illinois Railroad Law.

The Illinois Railroad Commission July 6 passed the following resolution:

"WHEREAS, the Supreme Court of the State in its opinion in the case of the Illinois Central Railroad Company *v.* The People, has recently decided the constitutionality and validity of the law of 1873 to prevent extortion and unjust discrimination by railroad companies of Illinois.

"*Resolved*, That the Chairman of this Commission be, and is hereby, instructed to call upon the officers of all the railroad companies in the state not conforming to the schedule of reasonable maximum rates of charges for the transportation of passengers and freight as prepared by the Railroad and Warehouse Commissioners, and upon the refusal of any railroad company by its officers to adjust its rates to conform to the lawful rates, to report the same to this Commission."

Coal Movement.

Anthracite coal tonnages for the six months ending July 3 are reported as follows, the tonnage credited to each line being only that originating upon it:

	1880.	1879.	Inc. or Dec.	P. c.
Phila. & Reading	2,658,833	3,516,489	D. 857,656	24.4
Northern Central, Shamokin Div., and Summit Br. R. R.	341,447	393,875	D. 52,428	13.3
Sun., Hazleton & Wilkesbarre	6,331	12,735	D. 6,404	50.4
Pennsylvania Canal	155,855	159,721	D. 3,866	2.4
Central of N. J., Lehigh Division	1,651,597	1,910,732	D. 259,165	13.6
Lehigh Valley	1,941,609	2,031,101	D. 89,492	4.4
Pennsylvania & N. Y.	14,322	13,795	I. 527	3.8
Dela., Lacka. & Western	1,622,429	1,743,452	D. 121,023	6.9
Del. & Hudson Canal Co.	1,438,789	1,539,924	D. 101,135	6.6
Pennsylvania Coal Co.	470,275	685,102	D. 214,827	31.4
State Line & Sullivan	20,419	27,072	D. 6,653	24.5
Total anthracite	10,321,876	12,033.998	D. 1,712,122	14.2

Anthracite tonnages for the half-year for six years past have been as follows:

1880	10,321,876	1877	9,915,120
1879	12,033,998	1876	7,165,324
1878	7,212,665	1875	6,208,380

In spite of the falling off from last year, it will be seen that this year's tonnage is greater than in any other year of the six. The trade is quiet just now, as is usual at this season, and there is some anticipation of a break in prices. This does not seem probable, however, unless the present agreement between the companies falls through. Some complaints have been heard that this agreement was not faithfully carried out, but the companies seem disposed to adhere to it.

Anthracite coal tonnage passing over the Belvidere Division, Pennsylvania Railroad, for the six months was as follows:

	1880.	1879.	Inc or Dec.	P. c.
Coal port for shipment	14,876	5,394	I. 9,482	175.6
South Amboy for Shipment	193,189	243,016	D. 49,827	20.5
Local distribution on N. J. lines	233,088	167,762	I. 65,326	38.9
Co.'s use on New Jersey lines	49,711	42,595	I. 7,116	16.7
Total	490,864	458,767	I. 32,097	7.0

Of the total this year 388,815 tons were from the Lehigh, and 102,049 tons from the Wyoming Region.

Actual tonnage of anthracite coal passing over the Pennsylvania & New York road for the seven months of its fiscal year from Dec. 1 to July 3 was: 1880, 372,028; 1879, 493,665; decrease, 121,637 tons, or 24.6 per cent.

Semi-bituminous tonnages reported are as follows:

	1880.	1879.	Inc. or Dec.	P. c.
Cumberland, all lines	1,028,880	759,605	I. 269,275	35.4
Huntingdon & Broad Top	107,161	69,627	I. 37,534	53.9
East Broad Top	39,177	33,736	I. 5,441	16.1
Tyrone & Clearfield	660,637	716,063	D. 55,426	7.7
Bellefonte & Snow Shoe	31,847	23,145	I. 8,702	37.6
Total semi-bituminous	1,867,702	1,602,176	I. 265,526	16.6

The semi-bituminous trade is reported as falling off slightly, and prices are weak. The Cumberland Companies have united in an address to the miners, calling their attention to the necessity for a reduction of wages, in order to compete with the operators of the Clearfield region who recently resumed at lower rates of pay. They ask that the men consent to a reduction to 50 cents per ton. If no reduction is made, the companies will be compelled to sell coal at a loss, or give up the field to their rivals.

Actual tonnage passing over the Huntington & Broad Top road for the six months was:

	1880.	1879.	Increase.	P. c.
Broad Top coal	107,161	69,627	37,534	53.9
Cumberland coal	130,654	92,827	37,827	40.8
Total	237,815	162,454	75,361	46.4

The Broap Top coal is mined on the line; the Cumberland carried through from Mt. Dallas to Huntingdon.

The distribution of Cumberland tonnage for the six months was as follows:

	1880.	1879.	Increase.	P. c.
Baltimore & Ohio R. R.	655,653	440,543	109,110	24.4
Bedford Div., Penna. R. R.	113,452	81,822	31,630	38.7
Chesapeake & Ohio Canal	240,524	211,989	28,535	13.5
Total	1,009,629	740,354	269,275	36.4

The figures given above for the total are the shipments over Cumberland & Pennsylvania Railroad to Cumberland and State Line; these figures are the shipments out from those points.

Bituminous tonnages for the half year are reported as follows:

	1880.	1879.	Increase.	P. c.
Barclay R. R. & Coal Co	220,614	171,589	49,025	28.6
Allegheny Region, Pa. R. R.	178,374	90,288	88,086	97.6
Penn. and Westmoreland	559,949	372,763	187,186	50.2
West Penna. R. R.	136,879	96,966	39,913	41.1
Southwest Penn. R. R.	27,816	19,235	8,581	44.7
Pittsburgh Region, Pa. R. R.	269,265	220,323	48,942	22.2
Total bituminous	1,392,897	971,164	421,733	43.4

The demand for bituminous is reported as lighter, and prices in some of the regions are falling off. Part of this is, doubtless, due to the slackening in the iron trade and the smaller demand from the furnaces.

Coke tonnages reported for the six months are as follows:

	1880.	1879.	Inc. or Dec.	P. c.
Alleghany Region, P. R. R.	32,136	26,396	I. 5,740	21.7
Penn & Westmoreland	66,709	53,808	I. 12,901	24.0
West Penn. R. R.	46,027	51,005	D. 4,978	9.8
Southwest Penn. R. R.	533,554	437,229	I. 96,325	22.0
Pittsburgh Region, P. R. R.	228,397	79,184	I. 149,213	18.8
Total coke	906,823	647,622	I. 259,201	40.0

The great increase from the Pittsburgh region is the most notable incident of the trade this year. The Connelsville Region had shown the manufacture of coke to be so profitable that it is extending wherever suitable coal can be found.

The coal tonnages of the Pennsylvania Railroad for the six months ending June 30 were as follows:

	1880.	1879.	Increase.	P.c.
Anthracite	502,789	469,535	33,254	7.1
Semi-bituminous	957,269	891,245	66,024	7.4
Bituminous	1,182,442	803,964	378,478	47.1
Coke	918,902	654,478	264,424	40.4
Total	3,561,402	2,819,222	742,180	26.3

The increase in bituminous and coke is most marked. The total tonnage for the month of June was 621,920 tons, rather above the average for the year and 21 per cent. more than for June of last year.

RAILROAD LAW.

Injury to an Employe by Defective Appliances—A Car Inspector not a "Fellow-Servant" of a Brakeman in Iowa.

One Brown, a brakeman on a freight train on the Chicago, Rock Island & Pacific Railway, caught hold of the "hand-hold" on the top of the car to descend to the ladder. The "hand-hold" gave way and he fell to the ground and was greatly injured. The company set up that it exercised reasonable caution in keeping its cars in repair and good order; that an inspector was employed to inspect cars, and whose duty it was to inspect cars before they start on a trip; that they are not liable to an employé for damages caused by the negligence of a co-employé. The Court below held in favor of the company, and instructed the jury to so bring in their verdict. The Supreme Court decided the other way, and held that a railroad corporation is required not only to provide proper appliances and machinery for the purposes intended, but, by proper inspection, know that they are in proper and safe condition for use, and the negligence of such inspection is the negligence of the corporation; that a brakeman and inspector are not co-employés in such sense as to release the company for negligence of the inspector; that the duty of inspection is affirmative, and must be continuously fulfilled and positively performed; or, in other words, the Court holds it is not enough that a car is inspected just before it starts for Chicago or some other point, to be going days or weeks, stopping and starting *en route*, but it must know that it is in good order constantly while in use.

The Iowa Law Concerning Damages to Live Stock.

A correspondent of the Chicago *Tribune* reports as follows a recent decision of the Iowa Supreme Court:

One Walsh hitched a horse somewhere. The animal broke loose, wandered away to the track of the Chicago, Burlington & Quincy Railroad, and was killed by an engine. He sued the company, and alleged that the horse was running at large and went on the track at a point where the railroad company had the right to fence the road. The evidence showed the horse had on a saddle and bridle and halter-strap, which had become unloosed and was dragging on the ground. The company held that the animal was not running at large within the meaning of the statute. The Court below held that the horse came within the meaning of the statute, was running at large, because he was not in the personal or physical control of any one. This, the Supreme Court held, was a correct ruling. The plaintiff, however, failed to establish by direct evidence that he was the owner of the horse. The Court below, however, helped him out by instructing the jury that possession is evidence of ownership, and if the proof shows that the horse was last in possession of the plaintiff before the injury complained of, it is sufficient proof of ownership. It would not take a rural jury very long to concoct a verdict of damages under such an instruction as that. Although the Supreme Court affirmed the Court below on all other points, it held that as to this it was wrong. The ownership of the horse was an issuable fact, to be established by direct and competent evidence. The plaintiff should have in some way shown he was the owner of the horse; and, inasmuch as he did not even show *prima facie* possession in himself, he failed to establish his action, and the Court below erred in its instruction. The case was, therefore, reversed. The doctrine established by this case may be thus briefly stated: Proof that notice of the killing of live stock by a railroad corporation was served upon a "station agent of the road" is sufficient; that Sec. 1,289 of the code, providing for the recovery of double damages for the killing of live stock, is constitutional; that where an animal is injured by a passing train so as to be valueless, and is subsequently killed by employés of the company, the liability of the company is not changed; that a railroad company is liable for damages caused by neglect to fence its road; that an animal is running at large when it is beyond the personal or physical control of any person; that to recover damages for injury to live stock ownership must be proven.

THE SCRAP HEAP.

Railroad Equipment Notes.

The Rhode Island Locomotive Works, at Providence, have recently delivered five heavy engines to the Wabash, St. Louis & Pacific road.

The Missouri Car & Foundry Co., at St. Louis, is turning out freight cars for the St. Louis, Iron Mountain & Southern and the Chicago, Milwaukee & St. Paul road.

The Pittsburgh Locomotive Works are running to their fill capacity, with orders on hand for several months ahead.

The Barney & Smith Manufacturing Co., at Dayton, O., have lately completed five passenger cars for the Wabash, St. Louis & Pacific road. They are described as high and roomy, 54 feet long and capable of seating 64 people, and (a very desirable innovation and improvement) with toilet accommodations, comprising marble stands and bowls, elegant baskets and trimmings of copper bronze.

The Union Pacific shops at Omaha are changing a number of old passenger cars into emigrant sleeping cars, similar to those in use on the Central Pacific.

At the works of J. H. Bass, Chicago, 250 men are employed, part of them working over-time. Besides heavy orders for car wheels the works are making a large quantity of castings for cars and other purposes.

The Schenectady (N. Y.) Locomotive Works have orders ahead for over 50 engines. A new shop 60 by 170 ft. is being built for the steam hammers and heavier blacksmith work.

The Ohio Falls Car Works, at Jeffersonville, Ind., are shipping a large lot of freight cars to the Minneapolis & St. Louis road.

The works of A. Whitney & Sons, in Philadelphia, are running full time, with heavy orders for car wheels.

The Lehigh Valley shops, at Hazleton, Pa., have just turned out a heavy passenger engine for use on the grades over the mountain. It has 20 by 24 in. cylinders, and four driving wheels 68 in. in diameter. It is expected to take the heaviest passenger trains over the mountain grades without a helper.

The Baldwin Locomotive Works, in Philadelphia, in the six months ending June 30 built 254 new engines and rebuilt 12 old ones. The work now in the shops includes 12 engines for Australia.

Iron and Manufacturing Notes.

Franklin Furnace, in Sussex County, N. J., has gone out of blast after a very successful run. It is one of the large blast furnaces in the United States.

The Daugherty Machine Works in Philadelphia are running full time on machine tools and steam hammers for railroad companies and machine shops. Orders for Cuba and South America are being filled.

The Joseph H. Brown Iron & Steel Co. is running its works in South Chicago full time and employs about 600 men. A new blast furnace is nearly finished.

It is reported that Princess Furnace, in Greenup County, is to be put in blast.

The firm of Ribon & March has been formed to build machinery of all kinds. The office is in New York and the works in Jersey City.

The Cedar Point Iron Co. has been incorporated in Baltimore by Frederick Prince, Jr., Nathaniel Burt, Horace B. Burt, Tooke Straker and John H. Harrison. The object of the concern is for manufacturing pig iron in that city.

The plate mill and heating furnaces of the Norton Iron Works, in Ashland, Ky., have been started up. The boiling furnaces will not be put at work for several weeks yet.

Bridge Notes.

The Atlanta Bridge Works, Wilkins, Post & Co., have secured the contract for building a bridge over Town Creek on the Memphis & Charleston road. It will be a Warren combination girder, 156 ft. span.

The Pittsburgh Bridge Co. has taken the contract for building a new highway bridge over the Monongahela at Pittsburgh, to replace the old bridge owned by the Monongahela Bridge Co. The bridge will be a steel-link suspension, similar to the Point bridge. The height will be 53 feet above low water, 22 feet higher than the present structure. The roadway will be 22 feet wide and sidewalks 8 feet. There will be three piers. The channel-spans will be 350 and the shore-spans 170 feet long. Work will be commenced immediately, and the structure completed in ten months. Wagon travel will not be suspended over a month.

The Keystone Bridge Works, in Pittsburgh, are running over-time, having many pressing orders on hand.

Prices of Rails.

In steel rails price continues at $60 to $62.50 per ton at mill, with little new business. Good judges predict that there will not be much variation from $60 per ton for some time to come.

For iron rails the market is less active. The only sales reported are some small lots at about $45 per ton.

Old rails are firmer, but without much present demand. Philadelphia prices are $22 to $24 per ton.

Pittsburgh quotations for railroad spikes are 2¾ cents per pound; fish-plates, 2¼ to 2½ cents, and track-bolts, 3½ to 4 cents per pound.

Monopolies.

The railroad monopolies don't have it all all their own way after all. A lady in Chicago sued the Central Pacific for $75 damages for allowing a locomotive to scald all the hair off a valuable dog expressed her from this city. She obtained judgment and collected the money before the company found out that it was a Japanese dog, and never had any hair.—*San Francisco Evening Post.*

There are men and men in this queer world. The captain of the Seawanhaka stood firmly at the wheel while the flames were scorching his flesh. A brakeman on the elevated road, on Monday, saw a passenger dragged from a station platform, hurled twenty feet into the street, and killed. And when his friends missed him, this brakeman, who seems to have known that the man belonged to the party, quietly remarked—not until he was asked, observe, for your true hero never volunteers information—"He fell off."—*New York Tribune.*

The Erie engineers hated to part with their old liberal broad-gauge engines, and don't seem to fancy the new idea. The old machines were the pet and pride of many of the engineers, and they gained an affection for them that makes the parting rather a serious matter. The engines and the engineers understood each other perfectly, but the new patterns have got new whims.—*Dunkirk Journal.*

Blast Furnaces of the United States.

The *Iron Age* gives the following statement of the condition of the blast furnaces of the United States on July 1 last:

	In blast.	Out of blast.	Not reported.	Total.
Charcoal	131	136	3	270
Bituminous or coke	115	109	—	224
Anthracite	167	68	3	238
Total	413	313	6	732
Capacity per week, tons	81,220	49,880	—	131,100

The average weekly capacity of the 413 furnaces in blast is 197 tons; of the 313 out of blast, 159 tons. On April 1 there were 696 furnaces on the report, of which 431 were in blast, 260 out of blast and 5 not stated. The decrease in the number in blast is in bituminous and anthracite, charcoal furnaces gaining.

A Mutual Mistake.

Probably there is no train which comes into Rochester, on any of her several railroads, that brings more newspaper items than the St. Louis express from the west, just before midnight. Last night, if the story of a Rochester passenger who came down from Buffalo may be believed, there was an amusing and a somewhat exciting incident on the train. An Ohio farmer, from the vicinity of Cleveland, had been riding in the first coach back of the smoker all the way from the city last named. He wore homespun blue pants and a coat which he had evidently purchased ready-made. On his head was a broad-brim black hat, and around his neck there was the unmistakable paper collar, permeated with perspiration. At Buffalo a young lady in a brown traveling dress, with an apparent abundance of the new-fangled, spread-eagle crinoline beneath it, got aboard the same car and commenced casting about for a seat. With that characteristic selfishness which marks the American traveler of to-day, nearly every man in the car who had not a lady or another man in the seat with him, had placed his little satchel on one side of the seat and himself on the other, to carry the idea that the whole seat was "taken." The damsel wriggled through the car and then started disconsolately to walk back. She hadn't reached the middle of the car, when our Ohio friend hitched his shoulders with marked individuality, twisted his shaggy head around on a large, thick, sunburnt neck, to see if anybody else was in the same predicament, lifted his carpet-bag from the outside of the seat to the floor, coughed nervously and said to her:

"I reckon I kin make room fur you, ef you want a seat."

She did want one, and she wasn't too bashful to say so. They had traveled side by side till they passed Croft's station, when a freight train suddenly came alongside and rattled by them in the opposite direction. The first crashing sound of the freight reminded the Ohioan of death and disaster, no doubt, for he turned his head with a jerk toward the window. Then observing that there was more scare than danger, he sat down, somewhat embarrassed. But the sudden movement had been too much for the paper collar. It was all broken up. His fair companion had spotted him as a good-souled old gentleman, and she laid aside her retiring disposition when she observed his embarrassment in the disjointing of the collar. She rose very politely and said:

"Can't I pin it for you, sir?"

"H'm! I reckon you kin, ef you're a mind to," said he, looking her squarely in the face and becoming reassured to such an extent that he soon acted "perfectly at home." Progress was then the watchword between the two, and before the train had reached Batavia, one would have mistaken them for an old widower and his gushing young bride, so thoroughly did they improve the time, chatting—he about "the gals to home" and she about everything.

The conductor had been through and taken the tickets, this side of Batavia, and the damsel's small talk, like a toy watch which is wound every hour, had about run down. Finally she took out her embroidered handkerchief and yawned behind it. Then she began to wink very slowly, as if by effort, and finally began to nod. Feeling quite as much acquainted as if it had been his own niece that sat beside him, the old gentleman put forth his hand to "nudge" the sleepy girl and remind her that it was "only a few miles further." Fatal movement for him! He touched her in about the locality of a pocket in her cloak. Springing to feet like a young tigress aroused, she exclaimed, in tones approaching a scream, which few of the sleepy passengers failed to hear:

"Don't you dare to touch my portmonnaie again! I might have known that you were one of these sharp young railroad swindlers disguised. They always put on a paper collar, poor clothes and a wig, to deceive people and steal their purses!"

All this was said about as rapidly as the words could be put together. But the astonished reply came as quickly as it could follow:

"Thunder and lightning! Who are you a-talkin' to, Miss? But you can't blackmail me—you can't; I'll expose you! Durn me, ef I wasn't all took in! Now get your seat whar' ye kin!" and he planted the carpet-bag back beside him on the seat.—*Rochester Democrat and Chronicle, July 5.*

An Old Railroad Notice.

An English paper reprints the following, originally issued 49 years ago:

Liverpool & Manchester Rail-Way. Time of departure, both

From Liverpool & Manchester.

First class, fare 5s.	Second class, fare 3s. 6d.
Seven o'clock, morning.	Eight o'clock, morning.
Ten o'clock, morning.	Half-past two, afternoon.
One o'clock, afternoon.	
Half-past four, afternoon.	

*** For the convenience of merchants and others, the first-class evening train of carriages does not leave Manchester on Tuesdays and Saturdays until half-past five o'clock. The journey is usually accomplished by the first class carriages under two hours. In addition to the above trains it is intended shortly to add three or four more departures daily. The company have commenced carrying goods of all kinds on the Rail-way. January, 1831.

Train Robbery.

The express car on a Missouri Pacific train was robbed at Winthrop on the morning of July 9. The telegraphic account says the train was a local train, running between Atchison and the main line of the Kansas City, St. Jo. & Council Bluffs road, to connect with a train from Kansas City. The robbers boarded the train at Winthrop, covered the express messenger, Simms, with revolvers in the presence of four passengers, marched him to the baggage car and compelled him to open the safe. J. C. Connelly, baggage-master, and Frank Gerhart, deputy watchman, were also covered with revolvers and searched for weapons, but none found on them. They then took from the safe a package of $265 and a package of jewelry, and expressed great surprise that there was no more money in the safe, and asked where the other package was. It appears Simms refused to receive a valuable money package from the northward-bound train, destined for Atchison, and the theory is the robbers knew this package was on the way and expected to find it in Simms' safe. When the train arrived at the junction the robbers made Simms signal the engineer to stop the train, and then leaped off and disappeared, after promising to return Simms' pistol, which they had taken from him.

His Name.

There was a Kansas City *Journal* reporter on the train that carried Grant from Galena, and one of his first exploits was to sail through the cars getting up a list of the people aboard. One of the persons he struck was a short, thick-set man with a beard, who sat gazing pensively out of the window with a cigar in his mouth.

"Are you one of the invited guests?" asked the reporter, tapping the man on the shoulder.

The man said he was, and kept on smoking.

"From St. Joe or Leavenworth?" asked the reporter, note-book and pencil in hand.

"Illinois," replied the man, still smoking.

"I'll have to trouble you for your name," persisted the reporter.

"Grant," said the man, still smoking.

"Initials, please," asked the reporter.

"Ulysses S. Grant," replied the man quietly.

"Oh," faintly ejaculated the reporter. And a strange light came in his eyes. And he moved on.

A Suggestion.

During Prince Leopold's trip from Toronto to Niagara his special car was fitted up at the suggestion and under the direction of his physician, Dr. Royle, with an Indian punkah, which had the effect of keeping the occupants of the car pleasantly cool. The punkah was set in motion by a brake-

man standing on the rear platform. It would be a boon to the traveling community in the heat of summer were Canadian railway companies, with their characteristic enterprise, to permanently introduce this valuable though cheap apparatus on their lines; the example thus set would doubtless be followed by other lines and steamboat companies. It would not be necessary to place a man on each car to 'kaintch' the punkah, as some mechanical contrivance will be made to do the work for the whole length of the train. The punkah is an institution in Indian climes. In railway traveling, fresh air can only be obtained by opening the windows, whereby travelers inhale as much dust as they do oxygen; the punkah obviates this, besides driving away the flies. This suggestion deserves the consideration of those whom it may concern, and if carried out will be appreciated by a grateful public.—*St. Catharines (Ont.) Daily News.*, July 3.

Struck by Lightning.

As if dead-woods, broken ladders and slippery car-roofs were not enough, a new danger to train-men is recorded. A dispatch from Montgomery, Ala., July 7, says: "Last Monday evening, while the Mobile & Girard passenger train was stopping at Linwood, Mr. Joseph Mason, the baggage-master, had occasion to cross the platform from his car to the depot and was struck by lightning. He was lifted from near the track where he had been thrown and carried into the car. Everything possible was done to restore him to consciousness, but without avail. The train was run through to Troy quite rapidly and the stricken man placed under medical treatment. In his cap a hole about two inches in length was found and a severe contusion on the head. Along his body to both feet was a red streak. All along this streak was one continued blister. The cap and clothing had the smell of sulphur."

Sufferings of an Engineer Party.

A dispatch from Stockton, Tex., June 30, says: "Major R. J. Lawrence and corps of the Texas & Pacific Railroad surveyors, after a number of days of extreme suffering from thirst in the White Sand Hills, miraculously arrived at the Pecos River without the loss of any men, but with the loss of some stock. Wagons were abandoned at different intervals of 40 miles along the trail. Great suffering was experienced by both men and stock, men straggling along the trail arriving at the river. From the morning of the 28th until next morning, with the assistance of those first arriving at the river, the last of the stragglers were brought in with much difficulty, as numbers of them when found were crazed from thirst and had entirely stripped themselves of all wearing apparel from head to foot. Three of them were found within 100 yards of the Pecos River, where they were drinking the blood of an animal they had killed. Some of the men were totally blind, and on arriving at the river plunged in head foremost. The party congratulate themselves from a narrow escape from perishing on the plains. Had it not been for several of the experienced and their bravery, the greater number would have died in the sand. The survey was abandoned in the Sand Hills, but will be resumed as soon as the men and animals recuperate."

OLD AND NEW ROADS.

Atchison, Topeka & Santa Fe.—This company has issued the following circular to its stockholders:

"Since the report of your President, which came down to Dec. 31, 1879, the mileage of your general system of roads has continued to increase rapidly. The Marion & McPherson branch has been completed to Lyons, 30 miles. The Cowley, Sumner & Fort Smith has been extended to Caldwell, 25 miles. The Manhattan, Alma & Burlingame will be finished this summer. The Pueblo & Arkansas Valley Railroad is being pushed 40 miles to the coal-fields near Cañon City. The New Mexico & Southern Pacific has already reached 180 miles beyond Las Vegas. To complete the construction of our branches in Kansas alone will require a million and a half of dollars. Besides this expenditure, in order to do our work economically and profitably, we must increase our rolling stock as rapidly as possible, lay additional side tracks, build stations and eating-houses, engine-houses, machine-shops—in short, meet the demands of the traffic which comes upon us. Our gross receipts were in:

	1st six mos.	2d six mos.	Year.
1878	$1,568,577	$2,422,291	$3,850,868
1879	2,753,017	3,628,425	6,381,442
1880	3,704,353	*4,295,647	*8,000,000

* Estimated.

And this without taking into account the probable business which 200 miles of only partially finished road, much of which is not yet operated, will give us. The very rapidity of the growth of the Atchison road and the corresponding increase of the receipts require us to furnish at once the facilities which are generally called for only after years of successful business. The directors, having in view that the road has, including the branches it owns, only a little over $16,000 per mile of stock, and believing that there is a reasonable prospect of its being able to pay 8 per cent. on an increased capital, consider it for your interest to make the necessary investment in as conservative manner as possible; and they propose, in order to meet the wants of construction, not to increase the debt, but to make an issue of stock at par to the stockholders, to the amount of 10 per cent. of the present capital.

"*Proposal.*—The company offers to stockholders of record at the close of business, July 24, a number of shares at par, equal to one-tenth of the amount standing to their credit on the books of the company, payable in four installments—Aug. 14, Sept. 1, Oct. 1, Nov. 1, 1880. This stock will be delivered when paid for in full. Receipts will be given on account of partial payments. The Assistant Treasurer is authorized to allow 5 per cent. on any prepayments after allotment. The holders of New Mexico & Southern Pacific shares, under Circular 48, who have agreed to exchange them for Atchison, Topeka & Santa Fe shares, under Circular 50, will be allowed to subscribe for their proportion. Fractional or other rights can be assigned in a form which can be obtained at the office. Any shares not taken Aug. 10 will be subject to the disposition of the board."

Augusta & Knoxville.—Track-laying has been begun on this road at Augusta, Ga., and it is stated that arrangements have been made for the completion of the road at least as far as Greenwood, S. C., this year.

Baltimore & Drum Point.—At a meeting of stockholders in Baltimore, July 8, it was resolved to authorize the board to complete the purchase of the interest of the state of Maryland in the Annapolis & Elkridge road, for $50,000, the price fixed by the state.

Baltimore & Ohio.—This company has put up elevators and shutes on its wharves in Sandusky, O., by which 2,000 tons of coal or ore can be handled in a day. Shipments of coal to the lake and receipts of ore from Lake Superior have increased very largely at that point.

Boston & Albany.—At the special meeting in Springfield, July 8, the stockholders voted to approve the lease of the Spencer Railroad. The road is a little over two miles long, from Spencer station to Spencer. The lessee is to retain $2,000 a year from the gross earnings for use of equipment, and to pay 25 per cent. of the balance as rental.

The stockholders also voted to authorize the purchase of the Springfield & Northeastern road for $450,000, interest on the purchase money to be paid from July 1, 1879. The road is 48½ miles long, from Springfield to Athol. It has lately been almost entirely owned by Chester W. Chapin and Willis Phelps.

At the meeting reference was made to the death of President D. Waldo Lincoln. A committee, consisting of Ex-Gov. A. H. Bullock, John P. Healy and Seth Thomas, was appointed to prepare a suitable memorial.

Boston Elevated Railroads.—Notices of organization have been filed for companies to build a system of elevated railroads from Boston to suburban points. There are four distinct organizations, but the directors of all are the same, and the evident purpose is to have the system under the same management. The lines are all to be of 3 feet gauge, and include 32½ miles of road. The four corporations are as follows:

The *Boston & Dorchester* is to build from the corner of Haverhill and Charlestown streets through Haymarket square, Washington street, Warren street into the Dorchester District, with a branch from Eustis street over Dudley and Hancock to Bowdoin street. The length is nine miles; stock subscribed $45,000.

The *Cambridge & South Boston* company is to build from a point near Mt. Auburn gate by Brattle square, Harvard street, Main street, West Boston bridge, Cambridge, Boston, Park, Pleasant, Eliot and Kneeland streets, Federal street bridge and across Fort Point Channel, by Dorchester avenue and Second street back to Bowdoin square. Length of road, eight miles; stock subscribed, $40,000.

The *Boston & Brookline* is to build from Haverhill and Causeway streets by Hanover, Washington, Court and Tremont streets to Villa lane in the town of Brookline; also a branch from Tremont street through Pynchon, Centre and South streets into the Roxbury District. Length of road, 6½ miles; stock subscribed, $35,000.

The *Charlestown & Milton* company purposes building from Sullivan square in the Bunker Hill District by Main street, Warren avenue and Warren bridge, Causeway and Commercial streets, Atlantic avenue, Federal street, by Neponset bridge to a point near Milton Lower Mills station on the Old Colony road. Length of road, nine miles; stock subscribed, $45,000.

Boston, Hingham & Hull.—This company is organized to build an extension of the Nantasket Beach road, just finished, to a connection with the Old Colony South Shore line near Hingham.

Buffalo & Southwestern.—At the meeting last week to consider the proposed consolidation with the Pittsburgh, Titusville & Buffalo, there were 5,857⅛ shares voted on, out of a total of 9,430. Of the votes 3,625 were in favor of consolidation, and 2,232½ against it. The agreement was therefore not ratified, the law requiring a two-thirds vote.

On July 9 a report was telegraphed from Buffalo that a lease of the road to the New York, Lake Erie & Western Company had been made. Concerning this, the Buffalo *Commercial Advertiser* publishes the following statement from the officers of the company:

"The announcement made that the lease had been consummated was premature. The facts are simply these: A suggestion, in the nature of a proposition, by the New York, Lake Erie & Western Company, has been made to the Buffalo & Southwestern Company, looking toward a lease of the latter company's road. A meeting of the board of directors of the Buffalo & Southwestern Railroad was held at the company's office in this city yesterday to consider the proposition, and the whole subject matter was referred to the Executive Board, with power. It will be some days yet before a final decision will be reached."

The road crosses the Western Division of the Erie at Dayton, and connects with the New York, Pennsylvania & Ohio at Jamestown. The road would seem to be of most service to the last-named company, as it would give it a line to Buffalo, which might be very useful.

Burlington & Lamoille.—The track of this road from Burlington, Vt., to Essex Junction, six miles, is being taken up, and its trains will hereafter use the Central Vermont track between those points, under the agreement lately made. The rails taken up will be used on an extension of the road from Cambridge Junction to Johnson.

Cairo & Vincennes.—The bondholders who bought this road at foreclosure sale have organized the Cairo & Vincennes Railway Company, and have filed articles of incorporation in Illinois. The capital stock of the new company is $5,500,000.

Cape Fear & Yadkin Valley.—The extension of this road has been finally located from Greensboro, N. C., to Germanton, and the line is being run from the last-named place to Bean Shoals. A large part of the grading between the present terminus at the Gulf and Greensboro is completed, and the working parties are soon to be put on the line beyond Greensboro.

Chicago & Alton.—Some stockholders having complained that they did not receive sufficient notice, the board has decided to extend until July 20 the option given stockholders of subscribing for one share of new stock for each 10 shares now held, under the circular of April 6, last. This extension is made with the provision that interest at 6 per cent. from May 20 shall be paid on all subscriptions now made.

Chicago & Northwestern.—The track of the Des Moines line, the former Des Moines & Minneapolis road, was changed from 3 feet to standard gauge, July 10, and through freight can now go to and from Des Moines without transfer.

Chicago, Burlington & Kansas City.—This company has been organized by the bondholders of the Burlington & Southwestern Company for the purpose of buying that road at the coming foreclosure sale. It is also said that the new company will make arrangements for building at once the proposed extension from Laclede, Mo., to Kansas City.

Chicago, Milwaukee & St. Paul.—The transfer of the Chicago, Clinton, Dubuque & Minnesota road to this company has not yet been made, on account of delay in preparing the necessary agreements.

It is reported that the company has bought the main line of the Mineral Point Railroad, extending from Warren, Ill., on the Illinois Central, northward to Mineral Point, Wis., 33 miles. The purchase does not include the branch of 18 miles from Calamine to Platteville. The road is chiefly owned in Detroit, and has paid its way for several years. It is said that it will be extended northward about 24 miles to a connection with the Prairie du Chien Division.

Cincinnati & Portsmouth.—In the Court of Common Pleas at Cincinnati, July 3, Rutherford & Co., contractors, obtained a verdict against this company for $55,000. The Court held that the contract was for quantities and not for a fixed sum per mile, and that the company had suffered no damages by delay in completing the work.

Cincinnati, Effingham & Quincy.—In the United States Circuit Court in Chicago last week argument was heard on an application to review a contract made by John C. Black, Receiver of this company, with Wm. Sturges for the completion of part of this road. The application charges that the contractor will, if the contract is carried out, make a large profit, and that all the property of the company will be absorbed, leaving nothing for the creditors and stockholders.

Cincinnati Northern.—This company has been organized by the persons who bought the unfinished Miami Valley road at foreclosure sale. The road is to run from Cincinnati to Xenia, O., and nearly all the grading was done two or three years ago.

Cincinnati Southern.—Later advices from Cincinnati state that the Louisville & Nashville proposition for a permanent agreement to maintain rates and settle all differences by arbitration was negatived by the Trustees, although the lessee company was willing to negotiate.

A conference was recently held in Chattanooga in relation to the building of a new union depot for this road, the Alabama Great Southern and the East Tennessee, Virginia & Georgia.

The Trustees have instructed their counsel to prepare a form of lease of a more permanent character than the one under which the road is now operated.

Cleveland, Painesville & Ashtabula.—This company has secured nearly all the right of way for an extension from its present terminus at Becker avenue in Cleveland west to a point on Willson avenue. The distance is about one mile, and will bring the road that much nearer to the centre of the city.

Plans are now under consideration for the extension eastward from the present terminus at Euclid on a line parallel with the Lake Shore road and south of it to the Pennsylvania line. The company has received a proposition from New York parties (name not given, but presumably the New York, Ontario & Western), who are said to be building a line to Buffalo, for a connection at that point, and the formation of a new line between New York and Cleveland.

Connotton Valley.—The officers of this company have been removed to Canton, O. The northern extension to Lake Erie has been put under contract.

Dallas & Wichita.—This road has been formally transferred to Col. Noble, Superintendent of the Texas & Pacific, as representative of the purchasers at the foreclosure sale. Work has already been begun on the extension to the town of Denton, Tex., and it is intended to have cars running to that point by September.

Dayton & Southeastern.—The stockholders have voted to authorize an issue of $400,000 second-mortgage bonds for the purpose of funding the floating debt.

Denver, South Park & Pacific.—Work is progressing on the extension from Buena Vista, Col., to Gunnison City, a distance of 64 miles. Track is laid from Buena Vista to Hortense, six miles, and the contract calls for the completion of the remaining 58 miles by November.

The company now own the line from Denver to Buena Vista, 135.1 miles; Buena Vista to Hortense, 6 miles; branch from Bear Creek Junction to Morrison, 8.8 miles; branches from Como to coal mines, 4 miles, making 153.9 miles in all, with 13 miles of sidings.

The company's statement gives the earnings for the year ending May 31 as follows:

Gross earnings	$1,659,764
Expenses (33.80 per cent.)	560,934
Net earnings	$1,098,830

The company has had the monopoly of a business which has enabled it to charge very high rates.

Under agreement with the Denver & Rio Grande this company will have the use of that road from Buena Vista to Leadville, and the Rio Grande will have the use of this road from Buena Vista to Gunnison City, when completed. The terms of both leases are the same, the lessee to pay one-half the cost of maintenance of way, and interest at 8 per cent. on one-half the cost of the road.

Eastern.—On the basis of an increase of 19 per cent. in the gross earnings of this road, for the seven months of its fiscal year to April 30, Boston stockholders are figuring out possible net earnings for the current year, sufficient to pay 3½ per cent. on the stock. Under the composition with the creditors the interest on the company's bonds is at the rate of 4½ per cent. to September, 1882; thereafter 6 per cent. After September, 1882, the interest will be increased 1½ per cent on $13,394,000, amounting to $200,910.

Evansville & Terre Haute.—A dispatch from Evansville, Ind., July 6, says: "The Evansville & Terre Haute Railroad to-day filed their first mortgage bond to the amount of $1,500,000 in the County Recorder's office. The Farmers' Loan & Trust Company, of New York, and J. M. Shackelford, of this city, mortgagee in trust, will negotiate for the new bonds."

The company's bonded debt by the latest report (August, 1879) was $1,017,000, of which $125,000 will mature Aug. 1, 1880. The new mortgage is probably a consolidated mortgage, intended to provide for the outstanding bonds and to furnish money to build some proposed local branches. The company's credit is good, and its earnings sufficient to pay all interest.

Galveston, Houston & Henderson.—The *Commercial and Financial Chronicle* says: "Default was made July 1 on the first-mortgage bonds of this company, which usually paid interest through Messrs. F. P. James & Co., No. 40 Wall street. The bonds on which default was made are the $1,500,000 first-mortgage 7 per cent. gold bonds issued December, 1871, and due in 1902. The default appears to be a very disgraceful one, as the road reports net earnings about double the amount necessary to pay its interest. Bondholders will probably do well to take steps without delay to employ able counsel and protect their interests."

In January last there was some trouble, and it was then stated that Messrs. Cowdrey and James, the largest holders of the bonds, had been carrying the coupons on their bonds since 1877, in order that the earnings might be used to pay off the floating debt and make improvements on the road. Interest had been paid to the smaller holders. Subsequently a settlement was reported made, and an issue of second-mortgage bonds was authorized, in which the coupons unpaid were to be funded. The yearly interest charge on the first-mortgage bonds is $105,000; the net earnings reported for 1879 were $229,560, or more than twice the interest.

It may be noted that the General Manager of the International & Great Northern Company, who had also had charge of this road for several years, withdrew from the management a short time since.

Genesee Valley.—The amount required by law ($1,000 per mile) having been subscribed to the stock, this company has been organized to build a railroad along the Genesee Valley Canal from Rochester, N. Y., to Milgrove, near the

Pennsylvania line, a distance of 114 miles. Under the act passed last winter the company can secure the canal as a road-bed at a nominal price.

Glenmary & Coal Creek.—This company has been organized to build a railroad from Coal Creek, Tenn., on the Knoxville & Ohio road, to Glenmary station on the Cincinnati Southern, making a connection between Knoxville and the Southern road. The incorporators are E. E. McCrosky, E. T. Wiley, W. S. Geers, Howard H. Wiley and Lewis Tillman, Jr.

Grand Junction.—The consolidation of the Belleville & North Hastings with this company has been completed, and officers chosen for the new company, which will retain the name of the Grand Junction Railway Company. The Belleville & North Hastings roads is completed from Belleville, Ont., to Madoc, 22 miles; the Grand Junction has 33 miles of completed road from Belleville north. The consolidated company purposes issuing bonds at the rate of $10,000 per mile, to complete and equip the road and provide new wharves.

Grand Rapids & Indiana.—The trustees invite proposals for the sale to them of bonds of the first mortgage issue of Oct. 1, 1869, to the amount of $200,000, for redemption by the sinking fund. Bids will be received until July 26, at the office, No. 23 Fifth avenue, New York.

Greenville & Columbia.—A dispatch from Columbia, S. C., July 9, to the Charleston *News and Courier*, says: "It is reported that the persons in New York and elsewhere who bought the Greenville & Columbia Railroad on April 15, for $2,963,400, will fail to make the payment of one-third of that amount, due July 15, and the road will in consequence be resold. Persons in Charleston, supposed to know the plans of the syndicate, are extremely reticent, but there is a strong impression that the current reports are true."

The report was that the purchasers represented the parties who have bought the controlling interest in the Richmond & Danville road.

Gulf, Colorado & Santa Fe.—The town of Belton, Tex., has voted to subscribe $75,000, and to give right of way through the town and 26 acres of land for depot and yard purposes, on condition that cars shall run to the town by March next.

The track on this road has now reached Caldwell in Burleson County, Tex., 36 miles north by west from Brenham, and 162 miles from Galveston. The telegraph line has also reached Caldwell. Work beyond that place is progressing steadily.

Herkimer, Newport & Poland.—The route adopted for this projected road from Herkimer, N. Y., to Poland, follows the valley of the West Canada Creek, and is 16½ miles long. A number of bridges will be required, but no heavy work grading, and no grades over 25 feet to the mile. The gauge of 3 ft. 6 in. has been adopted.

Hudson Tunnel Railroad.—The New York company of this name has been fully organized, and an agreement adopted for consolidation with the New Jersey company. The present organization is under the law passed by the New York Legislature with special reference to this company.

The New Jersey company recently filed new articles of organization under the general railroad law.

Work on the tunnel is reported as advancing steadily from the New Jersey side of the Hudson. Work will be begun on the New York end as soon as permission can be obtained from the Dock Department.

Hull & Nantasket Beach.—This company has been organized to extend the new Nantasket Beach road to Hull, a distance of about two miles.

Indianapolis, Decatur & Springfield.—This company is now running through passenger cars between Indianapolis and Hannibal, Mo., in connection with the Wabash, St. Louis & Pacific road.

Jacksonville & Southeastern.—A deed conveying the property of the old Jacksonville, Northeastern & Southwestern road to this new company has been recorded at Springfield, Ill. The consideration is $910,000 in stock in the new company.

Jersey City & Communipaw.—The New Jersey Circuit Court, after a hearing on the application of this company for a commission to condemn lands for the road, granted the order so far as to appoint a commission, but certified the case to the Supreme Court, in order that the questions involved may be settled as soon as possible. The commission can go on and do its work, however, but its report will not be approved until the Supreme Court makes a decision.

Lockport & Buffalo.—At the annual meeting, July 12, the following statement of accounts for the year ending July 8 was presented:

Balance, July 8, 1879		$1,355.11
Sale of $68,000 bonds		69,087.10
Stock subscriptions, loans, property sold, etc		10,706.94
Total		$81,749.15
Construction, right of way, etc	$19,485.87	
Loans and interest paid	12,728.45	
N. Y., L. E. & W. Co., loan, use of engine, etc	47,407.40	
		79,621.72
Balance, July 8, 1880		$2,127.43

The total amount of construction account to date is $275,149.63, to which are to be added a few bills yet unpaid.

Long Beach.—This road is now completed and trains are running over it. It is six miles long from a junction with the Brooklyn & Montauk Division of the Long Island road south and then east to Long Beach on the south shore of Long Island, a few miles east of Rockaway. The Long Beach Improvement Company has just built a large summer hotel there, and the same company, we believe, has built the road, but it will be worked by the Receiver of the Long Island Railroad.

Meadville.—This company has been organized to build a railroad from Meadville, Pa., westward to Linesville on the Erie & Pittsburgh road, a distance of 18 miles. It is also proposed to extend the road eight miles further, to Andover, O., on the Mahoning Coal Branch of the Lake Shore road.

Nantasket Beach.—This road has been completed and was opened for business July 10. It is a standard-gauge road, built entirely for summer pleasure travel, and runs along Nantasket Beach, a favorite Boston sea-side resort, from Point Allerton landing to the Nantasket House, a distance of four miles. It [will probably be extended to connect with the Old Colony road, making a rail route from Boston to the beach, which is now reached by steamboats only.

Nashville & Florence.—Track is now being laid on the first section of this road, extending from the Nashville & Decatur at Columbia, Tenn., west by south to Mount Pleasant, 11 miles.

Nashville & Tuscaloosa.—This company is negotiating with the Nashville, Chattanooga & St. Louis for aid in extending its road southward to Centreville, Tenn., on Duck River.

Nashville, Chattanooga & St. Louis.—This company makes the following statement for May and the eleven months of its fiscal year from July 1 to May 31:

	1879-80.	1878-79.	Inc.	P. c.
Gross earnings	$1,843,542	$1,542,549	$390,993	19.5
Expenses	1,064,224	948,707	115,517	12.2
Net earnings	$779,318	$593,842	$185,476	31.2

The increase in both gross and net earnings has been well maintained through the year.

New York & New England.—A bill in equity has been filed in the United States Circuit Court in Boston by W. F. Graham, of Enniskillen, Ireland, who owns 500 shares of Boston, Hartford & Erie stock, and brings the suit in behalf of all who will join him in the expense. The bill asks that witnesses be subpœnaed to answer fully a detailed investigation into the road's financial history; that the defendants, of whom the New York & New England Railroad Company is chief, be enjoined from selling any property in which the trustees of the Berdell bonds have any claim; that a receiver be appointed; that the trustees be compelled to render an account, and be held responsible for all money lost by their doings; that the Berdell mortgage be decreed invalid and the bonds void, or that the trustees be removed.

A meeting of the Boston, Hartford & Erie stockholders was held in New York July 9, at which a committee was appointed to consider the best plan of action for setting aside the foreclosure and sale of the road under the Berdell mortgage.

New York Central & Hudson River.—This company's June statement gives the earnings for the nine months from October 1, 1879, to June 30, 1880, at $24,289,115, an increase of $3,555,359, or 17.1 per cent., over the corresponding period last year.

New York, Lake Erie & Western.—This company makes the following statement for the eight months from Oct. 1 to May 31:

	1879-80.	1878-79.	Inc.	P. c.
Gross earnings	$12,057,030	$10,495,352	$1,561,678	14.9
Expenses	7,697,578	7,487,739	209,839	2.8
Net earnings	$4,359,452	$3,007,613	$1,351,839	44.9
Per cent. of expenses	63.8	71.3		

The following circular is issued by General Freight Agent Vilas:

"We are pleased to announce to the grain dealers of the West that the 'Erie Elevator,' located near our Pavonia Ferry in Jersey City, is now completed, ready for use.

"This grain elevator is without question the most complete and substantial building of the kind in the world. Every known modern improvement of pratical merit which would add to the convenience of working has been attached. The water pipes and hose are so systematically distributed through the building, and connected as they are with an immense tank located in the dome, which will always be kept full of water, renders the protection against fire almost perfect.

"The scales in the building on which all grain will be weighed are so perfect in their construction and working that we do not hesitate to assure our patrons of their receiving correct weights at all times.

"This elevator has a storing capacity of 1,500,000 bushels, and its facilities for unloading cars and for loading vessels are not equaled by any other elevator in America.

"We most cordially invite all grain dealers to come and inspect our improved methods for handling and storing grain at Jersey City."

The company is making arrangements for supplying food of good quality and at fixed and moderate rates to immigrants passing over its line, in order to free them from exactions to which they have heretofore been subjected. Stores will be established at several stations, at which provisions will be sold at a tariff of prices fixed by the company, and the articles sold will be subject to inspection at any time.

New York, Pennsylvania & Ohio.—The following statement for April comes by way of London:

	1880.	1879.
Gross earnings	$85,825	$330,8,2
Expenses, rentals and all charges	327,045	335,415
Surplus or deficit	Sur. $85,825	Def. $4,603

This shows a net gain of $90,428. For the four months ending April 30 there was a net surplus over all charges of $382,187, against a deficit of $61,044 for the same period in 1879.

Northern Pacific.—Grading is well advanced on the second 100 miles west of Bismarck. A contract for laying the track on this section has been let to Le May & Winston, work to be pushed as fast as possible.

Ohio & Mississippi.—A partial hearing was had this week on the new application of the Springfield Division bondholders for a separate Receiver, and on the application of the Receiver for authority to pay the July coupons on first-mortgage bonds. Further argument was postponed to July 17.

The Receiver's statement for May is as follows:

Cash, May 1	$23,572
Receipts from all sources	452,374
Total	$475,946
Disbursements	436,961
Balance, June 1	$38,985

The payments include $5,917 on old accounts and vouchers of the company. The receipts were $15,413 greater than the disbursements.

The standing of the suits now being heard in the United States Circuit Court in Chicago is thus stated in the *Inter-Ocean* of July 12: "In this case four separate phases have come up for consideration. In the first place, a bill was filed some months since by the trustee of the mortgage on the Springfield Division, asking a separate foreclosure and sale of that division. A plea in bar was filed to this bill, but this plea Judge Drummond, on Friday, overruled, and directed the foreclosure to proceed, and the company was allowed until Sept. 10 to file its answer to the bill. Next, the same bondholders made application in their bill for a separate receiver for the Springfield Division. This was referred to the Hon. James H. Howe, as special master, to take testimony. His report, filed July 10, finds the action of the present receivership, which covers the whole road, to be unjust to the Springfield Division. This point was argued and taken under advisement. Then an application has been made by the Receiver for an order to pay interest on the main line first-mortgage bonds, but this was resisted by the Springfield Division bondholders, on the ground that upon the finding of the report justice required that the money be appropriated to that division to repair injustice in the past. This point has also been argued and taken under advisement. Lastly, to secure a judgment lien on the main line, a separate suit upon the bonds alone was commenced by the Springfield Division bondholders at the same time with their foreclosure suit. The trial of this cause was begun Saturday afternoon, and will proceed again this morning."

Oregon Railway & Navigation.—The Dalles (Or.) *Mountaineer* says of the road this company is building along the Columbia: "There is no doubt now but that complete connection will be made this year between the Dalles and Walla Walla. Six months ago not a shovel had been put in the ground and it seemed as if the prediction of the company that they would be able to move the fall crop from Walla Walla by rail would not be realized for some time. But already the road-bed is completed for 45 miles from Celilo, and by the end of this week the Howe iron bridge at the Des Chutes will be finished and the track across the river. A large amount of work has been done toward Umatilla and in reality the heaviest part of the line is now completed ready for the track. Thirty days more will make a big showing for the road toward finishing the grading, and in 90 days we have no doubt the entire road will be finished. It has been a large undertaking for one season, and with the many obstacles which the engineers have met with in the location of the line along the river, rocky bluffs to go around and sand drifts to avoid, it speaks very well for that corps of gentlemen who have been engaged on it."

Philadelphia & Reading.—The Receivers have submitted a statement to the Court showing the condition of the company on May 24. A condensed summary is as follows:

Bonds prior to improvement and general mortgages	$24,189,500
Improvement mortgage	9,364,000
General mortgage and scrip	21,452,880
Income mortgage	2,454,000
Ground rents and mortgages	1,916,253
Total mortgage debt	$59,376,633
Debenture loans and scrip	15,651,109
Schuylkill Navigation loans	2,578,250
East Penn. bonds	495,900
Floating debt proper	10,254,767
Current accounts	3,309,516
Sinking fund and other entries, net cash liabilities	1,185,146
Total debt	$92,851,321
Common stock	32,726,375
Preferred stock	1,551,800
Total liabilities	$127,129,496

In addition to this there are $5,010,000 improvement mortgage bonds and $7,546,000 income mortgage bonds pledged as collateral.

On this statement the *North American* comments as follows:

"Some of the forms differ from those adopted in making up the annual report, but not very materially. The difference in the classification of the first-mortgage loans is due to the changes that have been made owing to the extension offered some months ago; the total is the same—$5,573,500. The consolidated mortgage remains the same—$24,189,500; also the improvement, $9,364,000, and the general, $19,686,000. It is to be noted, however, that five millions of the unissued general mortgage bonds have been pledged as collateral for the floating debt. To the amount of mortgage indebtedness must be added scrip issued for funded coupons and overdue coupons not funded, making a total of $1,766,880. In the income mortgage loan there has been an increase of $236,000 to $2,454,000, and in the bonds, mortgages and ground rents on detached real estate, $69,875 to $1,916,252. For the first time we learn that in addition to the five millions of unissued general mortgage bonds pledged for the floating debt, $7,546,000 of the income mortgage loan has been used in the same manner. The total of the mortgage debt foots up $59,376,632, against $57,303,877—an increase of $2,072,955, and this without taking into account the twelve millions pledged for the floating debt. The debenture debt is somewhat less, owing to a change in bookkeeping, which recognizes the scrip issued upon the general mortgage bonds as a mortgage debt and not a debenture. The debenture loan of 1868 is $1,600 less, owing to the payment of the bonds for freight, and the debenture loan of 1878 is $10,800 less, probably for the same reason. Owing to conversions the debenture and guarantee scrip is $171,460 less. The bills payable and loans have increased $2,009,995, but beyond this there is little opportunity for comparison, owing to the change in the system of footing the accounts, but the grand total of the liabilities of the company is $3,276,281 greater than it was on Nov. 30, 1879, this addition being the result of less than six months' business.

"The second exhibit, called 'Statement B,' shows the bonded debt of the company and the interest thereon, arranged according to the months in which it falls due. Of this it will suffice for our purpose to give the amounts falling due in each month, which go to make up the total of $5,629,765, but it must be remembered that this total includes interest on $5,010,000 of general mortgage bonds pledged as collateral, and $7,546,000 income bonds used unissued, but used in the same manner. The totals are as follows:

January	$1,417,802	July	$1,417,802
February	5,000	August	5,000
March	10,000	September	10,000
April	385,420	October	385,420
May	22,128	November	22,128
June	974,532	December	974,532

"Statement B gives the annual rental of leased railroads and canals at $3,322,854. There are also guarantees on railroad and other bonds, the annual charge on which is $302,511, and on $14,519,000 Coal & Iron Company bonds. The total of these foots up as follows:

Rental charges	$3,322,854
Taxes, etc	93,115
Guaranteed bonds, railroads	181,976
Iron companies	120,535
Coal and Iron Co. bonds	1,015,131
Total	$4,733,611

"The Coal and Iron Company's debts are as follows:

Purchase money and land mortgages	$13,534,234
Mortgages to R. R. Co	39,737,965
Total mortgage debt	$53,272,199
Debenture loan	1,731,000
Floating debt	1,900,482
Current debts and balances	1,616,216
Due R. R. Co. on loan account	6,358,520
Total debt	$64,878,417
Stock held by R. R. Co	8,000,000
Total	$72,878,417

"As compared with the balance sheet of Nov. 30 last, there is a decrease of $57,000 in the purchase-money mortgages and of $2,664 in the bonds and mortgages on real estate. In the bills payable there has been an increase of about $100,000, but in the other items that go to make up the floating debt there has been an increase of about a million. This is made up of $160,415 in bills payable, $232,236 in material certificates, $423,510 in current business debts, $13,585 in taxes, $124,-

534 in freight and $230,257 for advances on coal. The advances by the Railroad Company have amounted to $1,104,581 in the six months since the beginning of the fiscal year. The annual interest liabilities amount to $1,192,536.

"Deducting stock of both companies and debts due to the Railroad Company, by the Coal & Iron Company, the total debt liabilities are $111,633,253, not including $12,556,000 bonds hypothecated on the liability on leases and guarantees."

Pacific Railroads and the Government.—The Attorney-General of the United States has tendered an opinion in regard to withholding payments from Pacific Railroad companies for transportation services performed for the government, in which he claims that the whole of the earnings for such services should be withheld, and not the one-half thereof. He holds that the act of May 7, 1878, applies not only to the roads of the Union Pacific and of the Kansas Pacific railroad companies, but to all lines leased or operated by those companies or consolidated with them; consequently he advises that payment be withheld for government transportation over the Denver Pacific, the Sioux City & Pacific, and the Central Branch Union Pacific, as well as over the Union Pacific and Kansas Pacific railroads.

Philadelphia, Wilmington & Baltimore.—This company is now running its trains between Philadelphia & Wilmington on the block signal system. As soon as arrangements can be made, the system will be extended to Havre de Grace, and finally to Baltimore.

Richmond & Allegheny.—Tracklaying has been begun on the section of 27 miles between Richmond, Va., and Madden's Adventure Dam. It is expected that trains will run on this part of the line next month. The company expects to build its station in Richmond on the present canal basin.

St. Louis, Iron Mountain & Southern.—Contracts were to be let last week for the construction of the Camden Branch from this road at Gurdon, Ark., southward along the Ouachita River to Camden, 34 miles.

St. Paul, Minneapolis & Manitoba—In the United States Circuit Court in St. Paul, Minn., July 10, a bill was filed on behalf of a number of bondholders residing in Holland to set aside the foreclosure and sale by which the various lines of the St. Paul & Pacific companies passed into the possession of this company. The complaint is very voluminous and charges fraud and collusion on the part of the trustees, whereby those bondholders who did not join in the new company were deprived of their rights. It asks that defendants be compelled to surrender the roads and to account for their receipts, and that a receiver be appointed to manage the property, pending a determination of petitioners' rights in the premises.

The suit is in a little different form, but is substantially the same as the one recently dismissed by the Court.

Scioto Valley.—At a meeting held in Columbus, O., last week, charges were made by Mr. John B. Peters, formerly Superintendent, that there had been an over-issue of bonds and stock to the contractor who built the road. The engineers had made the road 100 miles long, but Mr. Peters claimed that it was really only 95¼ miles, and that securities had been issued on 4½ miles never built. He also charged that the work had been badly done, that poor materials had been used, light iron, and an insufficient number of ties, and that the bridges were poorly built. He claimed that the earnings had been incorrectly reported, and that the company was running behind on its current expenses, and now had a heavy floating debt.

An answer to these charges may be expected from the present management.

Southeastern, of Canada.—This company has made a settlement of its troubles with Drummond County, P. Q., by a paying back $35,000 of the municipal bonuses received. It is also promised that the branch from Richmond to l'Avenir shall be built.

Springfield & Northwestern.—A dispatch from Springfield, Ill., says: "The sale of the Springfield & Northwestern Railroad, a line running from this city to Havana, on the Illinois River, 47 miles long, was completed July 9. The road was purchased by Mr. Charles Ridgley of that city for the Gould combination of roads. The terms of the sale are not known, but as there was little else but the track to sell, it is thought it brought something in the vicinity of $200,000. It is said that the Wabash combination will at an early day, build a line from this city to Raymond, on its Decatur branch, and thus establish another route between here and St. Louis."

Troy & Greenfield.—A sudden and violent storm of July 10 made a bad wash-out on this road near Zoar, Mass. At the same time a land-slide near the mouth of the Hoosac Tunnel, and swelling of two small mountain streams, sent a large volume of water into the tunnel, flooding the track to the depth of several feet. No damage was done in the tunnel, but the wash-out at Zoar stopped freight traffic over the road, and made it necessary to transfer passengers for nearly three days.

Wabash, St. Louis & Pacific.—This company will receive bids at its office in New York until July 20 for $2,000,000 new 6 per cent. 40-year bonds, issued under the general mortgage. The terms of payment will be 20 per cent. on Aug. 1 and the balance in four equal installments at intervals of one month, with interest at 6 per cent. The general mortgage is for $50,000,000, and covers the entire road of the company in Ohio, Indiana, Illinois, Missouri and Iowa, and also all lines which may be acquired. They can only be issued for the following-named purposes: $33,000,000 to retire existing mortgages maturing prior to 1911; $6,000,000 to provide for equipment and permanent improvements; $11,000,000 for the construction or acquisition of such connecting roads as may be authorized by the stockholders, but not to exceed $15,000 per mile as first lien. The expenditures of the company for new equipment and permanent improvements during this year will be more than $2,000,000, for which the bonds now offered are to be issued.

At the special meeting in St. Louis, July 14, the action of the directors in leasing the Champaign, Havana & Western Railroad; in leasing and constructing the Detroit, Butler & St. Louis Railroad, from Butler, Ind., to Detroit, Mich.; in leasing the Missouri, Iowa & Nebraska Railroad, and in leasing 61 miles of the Pan-Handle road, from Logansport to the Indiana state line, was ratified by a three-fourths vote of the shareholders, and, therefore, the contracts are all approved.

Washington City, Virginia Midland & Great Southern.—All the counties on the line of the proposed extension of this road from Danville, Va., to Statesville, N. C., in which a vote has been taken, have voted aid to the road. On July 11 Davie County voted to subscribe $55,000 in aid of the road.

Western Maryland.—A contract for building the Baltimore & Cumberland Valley Extension of this road from Waynesboro, Pa., by Chambersburg to Shippensburg, 26 miles, has been let to Jacob Humbird, of Cumberland, Md. Work will be begun as soon as the right of way can be procured.

Wheeling & Lake Erie.—This company is making one more effort to secure the completion of the road, and is asking subscriptions of the people all along the line. Local papers state that the people are not responding very liberally.

ANNUAL REPORTS.

The following is an index to the reports of companies which have been reviewed in previous numbers of this volume of the *Railroad Gazette*:

	Page.
Allegheny Valley	152, 225
Atchison, Topeka & Santa Fe	335
Atlanta & Charlotte Air Line	226
Atlantic, Miss. & Ohio	364
Atlantic & North Carolina	364
Baltimore & Potomac	152, 319
Boston & Albany	50
Boston, Concord & Montreal	319
Boston & Lowell	74
Bur. & Mo. River in Nebraska	50
Canada Southern	74
Cape Fear & Yadkin Valley	237
Carolina Central	351
Central, of Georgia	25
Central, of New Jersey	151
Charlotte, Col. & Augusta	151
Chartiers (P., C. & St. L.)	213
Chesapeake & Del. Canal	326
Chesapeake & Ohio	96
Chesapeake & Ohio Canal	319
Chicago & Alton	136, 156
Chi., Burlington & Quincy	169, 176
Chi., Clint., Dub., & Minn	174
Chicago, Mil. & St. Paul	206, 213
Chicago & Pacific	96
Chi., Rock Island & Pac	351
Chi. & West Michigan	178
Cin., Hamilton & Dayton	374
Cin., LaFayette & Chicago	202
Cin. & Mus. Val. (P., C. & St. L.)	213
Cincinnati Southern	124
Cleve., Col., Cin. & Ind	184, 188
Cleve., Tus. Val. & Wheeling	162
Col., Chic. & Ind. Cent. (P., C. & St. L.)	213
Col. & Hocking Valley	214
Columbus & Toledo	214
Concord	200
Connecticut River	326
Consolidation Coal Co	124
Cumberland Valley	152
Dayton & Southeastern	70
Delaware	56
Delaware & Bound Brook	312
Delaware & Hudson Canal	96, 178
Del. & Hud. Can. Leased Lines	178
Del., Lack. & Western	75
Delaware Western	75
East Tenn., Va. & Ga	352
Fitchburg	74
Flint & Pere Marquette	70
Galv., Houston & Henderson	75
Georgia R. R. & Banking Co	200
Georgia R. R. Commission	241
Grand Rapids & Indiana	374
Grand Trunk	264
Great Western	204
Hannibal & St. Joseph	162
Han. Junc., Han. & Gettysburg	312
Housatonic	338
Houston & Texas Central	364
Huntingdon & Broad Top	96
Illinois Central	118, 123
Intercolonial	152
Kan. City, Fort Scott & Gulf	73
Kan. City, St. Jo. & C. Bluffs	226
Kentucky Central	319
Lake Shore & Mich. South	252, 268
Lehigh Coal & Nav. Co.	107
Lehigh Valley	137
Little Miami (P., C. & St. L.)	213
Long Island	70
Maine Central	202
Mass. R. R. Commission	45
Michigan Central	244, 250
Mil., Lake Shore & Western	238
Minneapolis & St. Louis	152
Mobile & Montgomery	152
Montpelier & Wells River	124
Morris & Essex	312
Nashua & Lowell	354
Naugatuck	238
N. Y., Lake Erie & West	6, 12
N. Y., N. H. & Hartford	26
N. Y., Providence & Boston	25
N. Y. & Oswego Midland	11
Northeastern (S. C.)	374
Northern Central	124
Northern (New Hampshire)	236
Ohio & Mississippi	151
Pacific Mail	312
Paducah & Elizabethtown	238
Panama	202
Pennsylvania Railroad	130, 137
Pennsylvania & New York	152
Pensacola & Perdido	238
Philadelphia & Reading	98
Phila., Wil. & Baltimore	11
Pitts., Cin. & St. Louis	213
Pitts., Fort Wayne & Chicago	352
Pittsburgh & Lake Erie	40
Pitts., Titusville & Buffalo	319
Pitts., Wh. & Ky. (P., C. & St. L.)	213
Portland & Ogdensburg	374
Prince Edward Island	152
Quincy, Mo. & Pacific	162
Raleigh & Gaston	26
Richmond & Danville	108
Richmond & Petersburg	177
Rome, W'town, & Ogdensburg	11
St. Louis Bridge Co	331
St. Louis, Iron Mt. & Southern	177
St. Louis, Van. & Terre Haute	96
St. Paul, Minn. & Manitoba	280
Seaboard & Roanoke	280
South Carolina	214, 280
South Carolina Railroads	40
Sussex	331
Troy & Boston	70
Union Pacific	151
Vicksburg & Meridian	312
Wabash, St. L. & Pacific	75
West Chester & Phila	75
Western, of Alabama	293
Western North Carolina	188
Western R. R. Association	46
Wilmington, Col. & Augusta	108
Wilmington & Weldon	108
Wisconsin Central	318
Wisconsin Valley	178
Worcester & Nashua	237

Vermont Valley.

This company owns a line from Brattleboro, Vt., to Bellows Falls, 24 miles. It is an essential link in the line down the Connecticut Valley, which gives the Vermont system of roads a connection to Springfield, to Long Island Sound, and to New York. The following brief statement is presented for the year ending March 31.

The earnings of the year were as follows:

Gross earnings ($4,895)		$117,590
Expenses (60.31 per cent.)		70,927
Net earnings ($1,944 per mile)		$46,663
New engine-house and Bridge at Bellows Falls	$10,951	
Dividend on stock, March	20,000	
		30,951
Surplus for the year		$15,712
Add surplus from previous year		13,116
Total surplus		$28,828

During the year a new engine-house with five stalls, and a new iron bridge over the canal at Bellows Falls were built. Renewals included 300 tons of steel rails and 15,597 new ties. There are now 14 miles of the main track laid with steel.

Louisville & Nashville.

The following statement for the year ending June 30, 1880, is published, several months in advance of the usual annual report. It is, of course, partly estimated for the closing month of the year.

The earnings, including all the lines acquired during the year, were as follows:

Gross earnings	$7,209,000
Expenses (56.61 per cent.)	4,132,000
Net earnings	3,167,000
Interest on debt	2,076,000
Surplus	$1,091,000

This surplus is a little over 12 per cent. on the stock.

The earnings of the Louisville & Nashville proper, including the South & North Alabama, were as follows:

	Earnings.	Expenses.	Net earn.
1879-80	$6,249,000	$3,416,000	$2,833,000
1878-79	5,387,600	3,155,800	2,231,800
Increase	$861,400	$260,200	$601,200
Evansville, Henderson & Nashville Div., 11 months	648,000	429,000	219,000
Total increase	$1,509,400	$689,200	$820,200

The Evansville, Henderson & Nashville Division (formerly the Nashville Division of the St. Louis & Southeastern was worked from Aug 1, 1879. The interest charge on the Louisville & Nashville proper was $1,881,000, a decrease of $5,000; the interest on the Evansville, Henderson & Nashville Division was $120,000, making a total increase of $115,000 in charges, and leaving a surplus of $832,000 for the year.

A dividend of 3 per cent. was paid in February last for the first half of the year, and one of 5 per cent. for the second half has just been declared, payable in August.

Burlington & Northwestern.

This company owns a line of 3 feet gauge from Mediapolis Junction, Ia., to Washington, 36 miles, with a third rail laid on the Burlington, Cedar Rapids & Northern track from Mediapolis Junction to Burlington, 16 miles. This makes a line 52 miles long, but no freight business can be taken from stations between Mediapolis and Burlington, by the contract. The report is for the year ending May 31, 1880; the road was in operation to Winfield, 34 miles from Burlington, until Nov. 17, 1879, when it was opened to Crawfordsville, 42 miles, and trains began to run to Washington, 52 miles, on Jan. 19, 1880.

The equipment consists of 3 locomotives: 2 passenger and 1 combination car; 45 box and stock and 11 flat cars; 7 hand, 4 dump and 1 iron car.

The total amount of stock subscriptions to date is $140,000, which will be increased to $190,000 by the adjustment of local subscriptions and taxes voted. The bonds amount to $203,800, of which $120,000 are first-mortgage 7 per cent., and $83,800 second-mortgage 8 per cent. bonds. Cost of road has been $292,729.64; equipment, $53,150.03; total, $345,879.67, or $9,608 per mile of road owned, without allowing for the 16 miles of third rail. The yearly interest charge is now $15,104, or $420 per mile. The President reports that the company has no bills payable and no floating debt that cannot be paid at sight. The company has secured abundant room for freight purposes and stock-yards at Crawfordsville and Washington.

The earnings for the year were as follows:

Passengers	$7,316.08
Freight	32,710.29
Mail and express	1,336.82
Total ($1,590.89 per mile)	$41,363.19
Expenses (49.03 per cent.)	20,281.72
Net earnings ($1810.83 per mile)	$21,081.47
Track rental, Mediapolis to Burlington	$[illegible]10.00
Interest paid	9,210.93
Taxes and general expenses	800.20
	13,221.13
Net surplus	$7,860.34

The Treasurer's report states that there are supplies in store amounting to $1,016.09, which might be deducted from expenses; but, on the other hand, the taxes and general expenses given above are properly chargeable to working expenses of the road. The expenses were increased by the transportation of material for the extension, for which no charge was made.

Freight business promises well. Passenger business has increased largely since the road was opened to Washington. Arrangements have been made to secure more cars, also to obtain better facilities for handling freight in Burlington.

Providence & Worcester.

This company owns a line from Worcester, Mass., to Providence, R. I., 43.41 miles; the East Providence Branch, 7 miles, and the Worcester Depot Branch, 1 mile. It leases the Milford & Woonsocket road, 3.88 miles, and the Hopkinton road, 11.55 miles, making 51.41 miles owned and 66.84 worked. The report is for the year ending Sept. 30.

The equipment consists of 29 engines, 41 passenger train cars, and 1,281 freight cars.

The general account is as follows:

Stock ($38,903 per mile)		$2,000,000.00
Bonds ($22,875 per mile)		1,176,000.00
Notes payable		590,000.00
Unclaimed dividends, pay-rolls, etc		29,576.76
Profit and loss		129,912.74
Total		$3,925,489.50
Road, etc. ($70,213 per mile)	$3,609,655.78	
Materials on hand	54,425.39	
Cash and receivables	261,408.73	
		3,925,489.50

Stock and bonds were unchanged; bills payable were reduced $35,266.28 during the year. Property accounts were reduced by charging $122,264 to profit and loss for depreciation in value of equipment.

The income account was as follows:

Net earnings, as below		$350,345.20
Property sold		1,647.58
Total		$351,992.78
Increase in cash and property on hand	$93,050.86	
New construction	14,045.07	
Dividends, 5 per cent	100,000.00	
Interest on bonds	70,500.00	
Other interest	38,193.07	
Bills payable paid off	35,566.28	
Unclaimed dividends paid	577.50	
		351,992.78

The net decrease of debt during the year was $129,194.64, which, with $100,000 dividends paid, represents the net gain of the company.

The earnings were as follows:

	1878-79.	1877-78.	Inc. or Dec.		P.c.
Passengers	$325,343.76	$330,285.85	D.	$4,942.09	1.5
Freight	573,973.39	519,596.62	I.	54,376.77	10.5
Mail, etc	20,535.10	20,993.70	D.	458.60	2.2
Total	$919,852.25	$870,876.17	I.	$48,976.08	5.6
Expenses	569,507.05	591,041.10	D.	21,534.05	3.6
Net earnings	$350,345.20	$279,835.07	I.	$70,510.13	25.2
Gross earnings per mile	13,762.00	13,029.27	I.	732.73	5.6
Net earnings per mile	5,241.55	4,186.64	I.	1,054.91	25.2
Per cent. of expe.	61.91	67.86	D.	5.95	8.8

Expenses include rentals paid, which were last year $7,500 for Hopkinton Railroad, $3,480 for Milford & Woonsocket, and $8,100 for Union depot and offices in Worcester.

The traffic for the year was as follows:

Train mileage:	1878-79.	1877-78.	Inc. or Dec.		P. c.
Passenger	229,676	227,153	I.	2,523	1.1
Freight	219,862	231,770	D.	11,908	5.1
Switching and service	171,062	93,900	I.	77,162	82.2
Total	620,630	552,823	I.	67,777	12.3
Passengers carried	1,639,126	1,627,247	I.	11,879	0.7
Passenger mileage	13,753,392	13,973,108	D.	219,716	1.6
Tons freight carried	675,580	624,722	I.	50,867	8.1
Freight mileage	19,286,814	17,916,241	I.	1,370,573	7.6
Average train load:					
Passengers, No.	59.88	61.50	D.	1.62	2.6
Freight, tons	87.71	77.29	I.	10.42	13.5
Average receipt:					
Per pas'ger per mile	2.37 cts.	2.36 cts.	I.	0.01 ct.	0.4
Per ton per mile	2.98 cts.	2.96 cts.	I.	0.08 ct.	2.8

Local business contributed 81.6 per cent. of the passenger mileage and 26.0 per cent. of the tonnage mileage. The average rate on local freight was 3.28 cents; on through freight, 2.46 cents per ton per mile. The average train hauled was 3.445 passenger or 30 freight cars.

During the year 750 tons of steel rails and 34,000 new ties were laid. Permanent improvements were made at several points.

A tract of four acres of land has been secured at Valley Falls, to which the repair shops are to be removed. The new shops and the conversion of the shops in Providence into freight houses are expected to cost $100,000, and this expense will be distributed over three years, probably. A tract of 4½ acres has been bought in Providence. It is now being graded, and the surplus earth used to fill other property. When graded, tracks for storing freight cars will be laid on it, giving yard room much needed.